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THE CONTENTS OF THIS BULLETIN ARE LISTED IN "EDUCATION INDEX"

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Mathematics in Secondary Schools Today

Reports of Objectives, Issues, Curriculum Trends, Methods and Materials, and In-Service Programs.

Planned and Prepared Under the Guidance of A Committee of the National Council of Teachers of Mathematics, a Department of the National Education Association.

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PREFACE

THE purpose of this mathematics number of THE BULLETIN of the National Association of Secondary-School Principals is to present to secondary-school principals the story of mathematics in secondary schools, 1954. The twenty-nine contributors from all parts of the country are teachers of mathematics at all levels of instruction. The levels of instruction discussed by the authors reflect one of the important trends in mathematics education of this decade; namely, the increasing practice of mathematics teachers, under the leadership of administrators, to work together on common problems and to plan mathematics experiences as a continuous sequence from kindergarten through the junior college.

The theme for this publication might be "Meeting Increasing Needs for Mathematics." In the discussions of objectives, vocational opportunities, curriculum, provision for individual differences, methods and materials, and in-service programs, it is hoped that school principals will find many practical suggestions on ways of carrying out a mathematics program which will more nearly meet the increasing mathematical needs of *all* pupils. We believe that improvement in mathematics programs can be brought about not only by modification of the course of study but also by the encouragement of teachers to follow good psychological practice, to make use of the best teaching aids in the best classroom environment, and to make the most of in-service opportunities, including active participation in a professional organization like the National Council of Teachers of Mathematics.

The Committee assigned the responsibility for the preparation of these materials wishes to express for the National Council of Teachers of Mathematics appreciation to the NASSP for making this mathematics number possible and to the authors for their fine co-operation and work.

JOHN A. BROWN, *Chairman*
Editorial Committee for the Mathematics Number
of the NASSP BULLETIN

Chapter I.

Objectives of Secondary-School Mathematics

A. WHY WE TEACH MATHEMATICS

RUDOLPH E. LANGER

IT IS a fact, indeed a familiar one, that influences which most profoundly affect our lives and thoughts and the modes of our existence are generally difficult for us to analyze. They seem to lie beyond the range of our reason. We feel them, and respond to them, but we can rarely say why, or whereof they consist. If we try to explain them we seem to seize only upon the relative unessentials: the essence itself escapes us. Experiences which strike us to the soul confound us. We cannot even give reasons for our intellectual preferments or satisfactions. Who can explain the uplift, keen as it may be, that music calls forth within us?

Why we teach mathematics seems to me to be a question that probes into this deeper realm. Of course there are enough reasons that occur readily to anyone. The indispensability of skill in arithmetic for the transactions of everyday living is a reason of this kind. It is surely valid enough, but it is also prosaic and utilitarian—hardly a satisfying answer to our question. I believe this is because we have something else in mind.

We should have something else in mind, for there are reasons that lie much deeper, indeed lie very deep. And being profound, these reasons are precisely such as are elusive when we seek to get clear with ourselves about them. The question "Why we teach mathematics" is an old one. It has been asked and answered many a time. But still, I too am ready to have my say.

As human beings we depend upon our senses, that is, upon our faculties of taste, smell, touch, hearing, and sight. These are the avenues from our environment into our inner consciousness. The effectiveness with which we operate as personalities depends upon these avenues. Through them we avail ourselves of the richness of life. One who is deprived of a sense is handicapped. The world is smaller for him and more confined. The scope of his existence is narrowed: his *elan* of life is curtailed. And the opposite

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is also true. Do we often say that a person of unusual discernment is endowed with a sixth sense?

Now I am going to maintain that this sixth sense is not a fiction but a fact. I am going to maintain that it exists; that it is as similar to any other sense in character and function as any of these is to another; and that we are endowed with this added faculty by nature. To describe this sense precisely and completely is, of course, impossible; just as it would be impossible to describe the faculty of sight to a person who was born blind. The best I may hope to do is to conjure it up and characterize a few of its aspects. I picture this sense, then, as manifesting itself in the peculiarly human genius for thinking in mathematical terms; in the power of the human mind to conceive mathematical ideas; in our instinctive confidence in mathematical deduction; in our capacity to appreciate and enjoy reasoning of the mathematical kind. To leave this faculty nameless would be awkward. Just for the purposes of this discussion I am going to refer to it as our *mathma*. Let me give you my reasons for maintaining that our mathma is properly one of our senses.

As I have already said, the world speaks to us and reveals itself through our senses. The completeness of our response to it therefore depends upon the efficiency of our sense reception. The extent to which our senses are developed in large measure determines the fullness of our lives. It is true life is possible even with heavily impaired sense equipment. Were we endowed with touch alone, we could find our way about and could build up a certain awareness of the world. But it would be a narrow and constrained world. There would be no freedom in it. Our experiences would be monotonous and limited; our imaginations could build only with impoverished ideas.

How vastly different the world is made by our senses of hearing and sight. With a widened sphere, they allow us to move about freely and confidently. The gamut of tasks we may perform, and the efficiency with which we may perform them, is immeasurably enlarged. The horizon of our awareness is pushed out from us, and the scope of our spiritual as well as of our material existence is made more abundant. In memory we can store away experience in much greater variety, and our imaginations are therefore filled with color and light. Sitting alone and in silence we can conjure up before us scenes of action and grandeur, or enjoy again past musical delights.

Does our mathma do such things for us? I think it does. Precisely like sight and hearing, but much more than these, it pushes out the bounds which confine our world. It gives us the means for more complete and satisfying readings of our experiences. It opens up for us realms of activity which would otherwise be closed. Let me be more explicit upon this point.

In this day everyone finds that he must deal at almost every turn with numbers, sizes, shapes, rates, intensities, trends, *etc.*, namely with things

and concepts of mathematics. But in this domain the abilities of our traditional a set by merely looking at them if that number is two, three, or four. But in a set by merely looking at them if that number is two, three or four. But in this we already fail if the number is ten or more. We draw in our knowledge of sizes and shapes mainly through touch and sight. But the scope of touch is very restricted, and the fidelity of sight is notoriously bad. Moreover our immediate experiences are limited to objects that are small. Our visual horizon never lies more than a few miles away, and the loudest of sounds can hardly be heard much farther. Our traditional senses supply us, therefore, only a restricted and insular world. The animals have the same traditional senses as have we, but their worlds are not expansive like ours.

Now how does the matter really stand with us? Certainly not as would be indicated above. The most restricted human mentality, unless positively abnormal, counts and thinks easily in hundreds and thousands. To many, the million is a familiar idea, and our legislators are unabashed by the billion. Through our feeling for geometry and proportion we have separated the concept of shape from that of size. Disregarding the puniness of our actual experiences, we do not hesitate to assign shapes to magnitudes however immense. By mastering the processes of arithmetic, we have found ways to avoid the labor of excessive counting, and by grasping the essences of geometry and trigonometry we have cast off the yoke of the yardstick and the measuring tape. In algebra we have broken away from particular cases and gotten to the level of dealing with whole classes of them at a single stroke. Along this way we have discovered many general laws by which the world is ordered. In our thoughts we allow no distance to confine us. The astronomer uses the light-year as his unit, and tells us of distances which total to millions of these. Does not this show how our sense of mathma has pushed out the bounds of our universe?

But the matter by no means rests there, for we exist not only in space but also in time. And in time we find ourselves always before the great barrier of the present. On the one side of this divide lies the past, the realm of our experiences, the way we have trodden. In this our traditional senses have served us; by their help we have stored up in memory our larder of facts and ideas. But beyond the present lies the future, and there the matter is different. Into that region neither sight nor hearing, nor any other of our traditional senses penetrates. For them the barrier is final and complete. Were we dependent upon them alone, the future would stand before us ominously, a realm in which only the unexpected might be expected.

Is it indeed so with us? No! Every man alive is continually reaching into this future, and, moreover, not gropingly but with assurance. And the means by which he does this is *calculation*. Calculation is the instrument by which we are all constantly anticipating the hazards of what is to come. The

workman calculates the amount of his forthcoming pay-checks. From trends and intensities the weatherman calculates tomorrow's storm. By that predictive institution, the budget, we regulate our lives and temper our needs and pleasures to the avoidance of difficulties that are not yet. Insurance and annuity plans and schemes of installation buying are all directed at the future, and our government does not hesitate to demand of us that we predict—under penalty—the extent of our next year's income. Without our sense of mathma there could be none of all this.

If we turn to consider the operations of mankind in group activities, we see that the scope of mathma is immensely widened. There is hardly an activity into which it does not enter. In many it lies at the very heart. Every feat of engineering or technology—for instance the construction of a bridge or a skyscraper, of a radio or of an airplane—is in a very real sense accomplished twice. It is accomplished first in the future, "on paper" by mathma, and then again later in material realty. In all of industry we have freed ourselves of costly and time-consuming trial and error. Calculation pure and simple is our guide. And in this there is hardly a bound to the confidence we repose in our mathma. Though a newly designed plane may weigh a hundred tons, we expect it to take the air on its maiden flight. In the event of any structural failure, rare though it be, we find ourselves surprised and annoyed.

In the year 1821 the planet Neptune was discovered by mathematics. Neptune is a heavenly body fifty three times as large as the Earth. It is at a distance of three thousand millions miles from us, and rushes through space at the speed of twelve thousand miles per hour in its course around the Sun. This planet had never been seen. It cannot be seen without the use of a power telescope, because of its enormous distance. It is away below the threshold of any of our traditional senses. But the human mathma could pick it out of the vastness of space. As the great astronomer Herschel once put it: "We saw it as Columbus saw America from the coast of Spain. We knew it was there because we had felt the tremors of its motion along the far-reaching line of our mathematical analysis." Such is the grandeur of the role of mathma in the field of science.

I could give many more illustrations of mathma in science. Everywhere, in space and in time, it has enlarged our world. Seated in the comforts of our homes we may, by the turn of a knob, see and hear events which are remote from us by distances of countless horizons. The astronomer looks through instruments designed by mathma into the depths of inconceivable space, and calculates the sizes and weights of colossal suns by the use of light which departed from them before the first word of human record was written. And another, meanwhile, prints into almanacs the times—to the precise second—of eclipses and other events that will occur only after his lifetime. The

physicist uses his mathma to draw away the curtain from things that are very small. Electrons, neutrons, atoms, nuclei, and all such are things that are not sensible to us through our traditional faculties. Mathma is the only sense through which we can make contact with them. But we have such confidence in this sense that we will dare our lives even to the demonic powers of atomic fission, if our calculations tell us the conditions are safe.

Now, you perceive, the reason "Why we teach mathematics" is a very profound one. Our untutored senses are the gifts of nature. The efficiency with which we may use them, and the amount of return we get from them, is, however, largely dependent upon their cultivation. Through our natural sense of taste is vague, trained tasters of tea or whiskey achieve prodigious discrimination. One sense of touch is naturally blunt, but it can be sensitized by training to become the reading instrument of the blind. The artists' cultivated vision observes beauties which to a layman remain unsuspected, and the disciplined hearer finds sources of profoundest delight in music which to the yokel is only meaningless noise and confusion. The senses can be educated, and the trained and the untrained senses stand poles apart.

The life's work of a teacher is to deal with human material. It is his task to supply factual and historical backgrounds, to impart techniques, and to train senses. Among the senses that of mathma is, perhaps, more capable of training than any other. And in our time and place mathematical instruction is of peculiar significance. We are the children of so-called "Western" culture. Flourishing in modern times, this is the culture of the peoples of America and the lands of Western Europe. This culture differs from that of other present-day peoples, such as those of the Orient, and from the cultures of past peoples, such as those of Greek or Egyptian Hindu antiquity. Its characteristic features have in large measure been effective in making us as we are. Wherein, then, do we differ from the peoples of other cultures? The answer to this question is a pointed one. The Western culture is distinguished above all in this, that its people are gifted in mathma far beyond what has appeared elsewhere or heretofore. The Western culture is industrial, technological, and scientific; in short, it is far and away the most mathematical. In our culture we calculate and think in dynamic terms. We have found ourselves gifted with excelling mathematical versatility and inventiveness. We have found in ourselves the genius to master the control of things in flux and to invade the realms of the infinite.

This, of course, does not say that all individuals in our society are mathematically gifted or eager. We know that that is not so. But it points up how out of step one is who is content to stultify his mathma. He is like one who steels himself against good music, wants to know nothing of what makes the world go 'round, and would climb no mountain to see a sunset. Such are not they who lead the world.

B. GOALS IN ALGEBRA

JACKSON B. ADKINS

ALGEBRA is, of course, essential for the continued study of mathematics. To study algebra as a terminal course in mathematics is quite another matter. This paper discusses the goals of such a terminal course and assumes that the course will be given in the ninth grade. The student of mathematics will observe that there is no real conflict between the goals herein presented and the goals for pupils who intend to continue the study of mathematics. There might be a difference in intensity but not in the general pattern of the course. This pattern is formed around three major goals. The ninth-grade algebra course should achieve:

1. Greatly increased skill in and knowledge and understanding of arithmetic.
2. Some appreciation of the postulational basis of mathematics.
3. Understanding of and some skill in using algebra as a device for answering questions about quantitative relationships.

All the desirable "practical" aspects of arithmetic are embodied in the first goal. The second and third goals are admissible only if one is willing to admit that the impact of mathematics on our culture is so great and so pervasive that no person can claim a liberal education consonant with our times if he is wholly ignorant of the field of mathematics. A beautiful and convincing exposition of this thesis is presented by Morris Kline in his recent book, *Mathematics in Western Culture*.

The immediate result of introducing letters to stand for numbers is to force the attention of the pupil onto the postulates that govern the combining of numbers. Thus the routine response to 12 x 7 gives way, in the algebraic equivalent, $(a + b)c$, to an examination of the distributive postulate in mathematics and a much fuller understanding of the statement that 12 x 7 is the same as $(10 + 2)7$. This more sophisticated approach to arithmetic opens up the subject and illuminates it in a way not usually even "sensed" in the seventh and eighth grades. This is true, not because the teachers of those grades didn't talk this way, but because the pupil wasn't "ready" for it. He was too young. The great advantage of algebra, rather than just another arithmetic course, as a vehicle for this strengthening of the arithmetic is that an entirely fresh setting is provided. This excites the pupil and produces a magnificant "clinching" of all elementary arithmetic that the old setting could not possibly achieve.

The extraction of square root, the factoring of large numbers with the resultant review of the multiplication tables, the review and drill in fractions—all achieve a different coloring and an added stimulus when they appear

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as necessary aspects of the solution of equations. Percentage is simplified, clarified, and made useful when taught in the language of algebra.

The associative postulate for multiplication, $a(bc) = (ab)c$, must be "brought up to the surface of the mind" and explored when the equation $2/3\ (3x - 5/2) = 7$ is to be multiplied by 6. The axioms of addition, substraction, multiplication, division, and substitution throw further light on the postulational basis of mathematics and, at the same time, provide a thorough review of the fundamental operations of arithmetic.

The algebra teacher is impelled to point out, from time to time, the fundamentals of a logical system: undefined terms, defined terms, postulates, the "if-then" pattern of thought. Thus, the laws of operation with signed numbers are never proved. Their plausibility and usefulness may be illustrated in many ways. But in the final analysis they are seen to be postulates. The "if-then" pattern of thought governs the solution of equations. The symbol, 3x, is *defined* to mean 3 times x. The symbol x^3 is *defined* to mean x x x. At this level we usually accept "greater than" as an undefined term. We don't worry much about defining "equality."

The third goal, to see algebra as a device for answering questions about quantitative relationships, ties the subject plainly to mathematics as a whole and opens up to the curious fourteen-year-old great vistas of unexplored knowledge. We elaborate the goal in the following manner:

1. Problems (in mathematics) deal with quantities.
2. If the problem can be solved, these quantities are related.
3. These relations, when translated into algebraic symbols, produce equations.

With these ideas in the background, the pattern of thinking becomes clear: We must find out about what quantities a problem is talking. We then put down symbols for the quantities; then state the relation (or relations) between the quantities—using the symbols. Equations result. The crux of the matter is, of course, stating the relation between the quantities.

Relations between quantities always appear in a problem in one or both of two ways. Either they are explicitly stated by the words of the problem or they are implied by the words of the problem. In the first case, the job is a straight translation job from the marks in the book which we call words to the marks (letters, equals signs, *etc.*) employed for convenience in algebra. If the relationship is implied, then the words of the problem must be a sufficient cue (like a cue in a play) to cause us to remember the relationship. Take a simple example: The length of a rectangle is twice its width. The perimeter is 100 inches. Find the dimensions. If we denote the length by l and the width by w, then the first relationship between these quantities is explicitly given by the words "length is twice the width" and straight translation produces the equation $l = 2w$.

The second relationship is implied by the words rectangle and perimeter. These words must be a sufficient cue to cause us to remember "perimeter of

a rectangle is the sum of twice its length and twice its width." The translation of this remembered relationship produces $2l + 2w = 100$. With these two equations, the student of algebra can then go on and perform the necessary substitutions, additions, substractions, *etc.* to reach the answer.

This pattern of thinking is completely general. Thus, formulas take their place in the pattern as convenient devices for remembering relationships. The great bulk of the study of elementary geometry falls into place as merely a study of the relationships between the various parts of figures. Trigonometry, likewise, is exhibited, in its elementary aspects, as a further study of relationships between parts of a triangle. It becomes plain to the student that a problem is "difficult" because the relationships between the quantities are obscure.

The whole study of mathematics takes on form and sense if the pupil gets hold of this general pattern of thought in elementary algebra. He has a framework to which more and more ideas and items of information will cling. Every subsequent course in mathematics will broaden and strengthen this fundamental idea and will clarify the concept of postulation thinking. If he studies no more mathematics, here is a permanent and understandable answer to the question, "What is mathematics all about?"

No subject in the curriculum suffers more than algebra from the obscuring of the woods by the trees. It is so easy, under inexpert handling, to get so bogged down in the details of the subject that the pupil often fails to see where he is headed. The "woods" that must constantly be kept in front of the pupil's eyes are: (1) algebra is a device for dealing with quantitative relationships; and (2) mathematics has a postulation basis. It is fatal to let these drift into the background of the child's thought. When they do, the subject becomes pointless, uninteresting, and a doubtful aspect of general education. When they stay in the foreground so that each day's work "sticks" somewhere on this framework, then there is a steady access of understanding and a broadening appreciation of the role of mathematics in our culture.

The nature of the subject matter demands steady and hard work from its students. At the level under discussion it does not demand more than average intelligence. It demands concentration, neatness, and habits of checking each step before proceeding. The earnest school administrator who recognizes the pervasive nature of mathematics in modern culture can get results from good teachers if he permits them to demand work from their pupils. The softness of much present-day schooling that requires little or no "homework" and no results that take steady effort is the greatest enemy of the subject.

Algebra puts arithmetic into a challengingly different setting. It distinguishes between "truth" that is relative to postulates and the "absolute truth" of the pupil's religious beliefs. It enables even the poorest student who has no

intention of pursuing mathematics to understand in broad outline what the great body of civilization's mathematical knowledge is all about. It generates that satisfaction and emotional stability that derive from knowledge that a hard job has been well done. In its social context, algebra takes its place as the *sine qua non* for introducing each generation to the vast body of mathematical information that the race must pass on.

As the accumulated knowledge of the race expands, it becomes increasingly important—and difficult—to select those items that should be passed on to all people. Only the kind of algebra we are talking about here can be justified for all people. When the trees obscure the forest and the pedant pursues recondite elements of the subject because they amuse him, the real goals of the subject are lost and its place in general education becomes untenable. But, if properly taught by good teachers who have a setting in which they can function, it opens the path, in exciting fashion, to one of the great achievements of the human mind.

C. GOALS IN GEOMETRY

JESSIE MAE HOAG and ZEKE L. LOFLIN

THERE is danger that principals, counselors, planners of curricula who studied geometry some years ago should judge its values by goals no longer held by teachers today. The viewpoint of geometry has gone through much variation in its long development. The geometry of the Egyptians of 600 B. C.—a collection of facts most useful to the rope-stretchers surveying the land, to the businessmen who wanted to know how much grain a granary would hold, or to the builders of pyramids and temples—bore little resemblance to what the Greeks made of it when they became intent on proving that these facts were true. Nor do the aims of geometry taught in high schools that attempt to educate all the people to make a living, to be intelligent citizens, to live happily with themselves and others greatly resemble either the aims of universities teaching geometry to adults as a historical and finished example of a logical system or the aims of the earlier high schools trying to prepare a minority of the population for college entrance in an age when it was believed that memory work and difficult thinking strengthened the mind in much the same way that exercise strengthens the muscles. Change in the goals of geometry teachers in the last thirty years, motivating revisions of texts and methods, has adapted geometry and given it fascinating possibilities of being a very powerful instrument in attaining some of the most fundamental goals of education today.

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Some of the facts and techniques of geometry are so important to the average citizen that we feel impelled to teach them in the junior high school. Among these are rules for finding areas, circumferences, and volumes, the Pythagorean Theorem, understanding of the nature of measurement, ability to measure angles as well as lengths. Such facts have usefulness in a wide range of vocations as well as in our amateur activities. Other facts having great intrinsic value are those about proportion, both in connection with similar figures and in its more general aspects. We might use them in reading house plans or maps, varying a diet or a receipe, or comparing volumes of canned goods.

Even superficial comparison of good recent texts with texts of a generation ago shows that in demonstrative geometry too we are trying hard to show applications of the facts we study. We try to teach theorems not so much as abstract ideas as general ideas having specific example. Our texts are full of examples of applications of theorems in navagation, surveying, geography, construction, in the form of the physical universe, and even in design. We try to get pupils to acquire the habit of recognizing specific applications of the general statements they prove.

While knowledge of the facts of geometry and of how they can be used rank high among our objectives, the most important goal of all in the minds of most teachers is "to develop the habit of clear thinking and precise expression." In a study in *The Mathematics Teacher* in 1950,[1] Kenneth Brown states that ninty-four per cent of the teachers surveyed included this as one of the five objectives they considered most important. It was chosen as the most important of all by twice as many teachers as any other objective.

The first aspect of clear thinking that we seek through our classes is the ability to discover new facts. The facts may be unimportant; the ability to discover them is not. The Golden Age of Greece was a time of mathematical discovery and of delight for those who discovered. In the centuries when Euclid's geometry was merely reproduced, the subject became sterile and dull. Now again we seek pleasure in the actual experience of discovering laws by controlled experiment. In hundreds of classes where, instead of proving only the facts stated in the text, pupils use movable models such as the Schacht instruments, a variety of home-made models, or ruler and compass constructions to set up a set of conditions and then discover the results and state them, we see evidence of the teachers' aim to develop independent thinkers as well as logical ones. We often list the development of space perception and imagination as one of our goals. This is correct as far as it goes. We might better say that we hope to encourage careful observation in all fields and to develop inquiring attitudes of minds that will

[1] Brown, Kenneth E., "Why Teach Geometry," *The Mathematics Teacher*. March. 1950, pp. 103-106.

look for casual relationships in nature and in our social and economic life as well as in mathematics.

Discovery and formulation of new facts involve more than mere observation. They involve analyzing relationships in a more or less complex situation and determining which elements are essential and which are irrelevant. Geometry provides a medium where these techniques may be studied in both the inductive and deductive form of thinking. In discovering facts by experiment, the pupil should learn to vary all conditions, and to distinguish between those that consistently produce the same results and those which do not seem to be related to the results observed. He should learn to wonder, "Is that always true?" "Under what condition is it true?" "Why does this happen?" He should learn to generalize with caution. He should learn that these techniques of thinking apply in drawing conclusions in science and in society as well as in mathematics. He should learn not to make sweeping generalizations about large groups of people without sufficient evidence to justify them. He should learn not to claim that results which took place under limited conditions are true under more general conditions. There is the story of the mathematician and his friend who rode by a flock of sheep. "Those sheep have just been sheared," said the friend. "Apparently so," said the mathematician, "—at least on this side." A *little* of this habit of qualifying statements we would like to impart to our pupils.

As the pupil learns to recognize new facts he must learn to state them. Accurate expression of facts, accurate understanding of reading, and accuracy of thinking are goals that are largely tied in the same bundle of techniques; but we can check on the latter two chiefly by checking on accuracy of expression. Some of the techniques of accurate expression can be taught better in a geometry class than even in an English class. We try to teach pupils not to omit essential modifying adjectives or qualifying phrases. "Alternate—interior angles are equal" does not express the same idea as, "If two parallel lines are cut by transversal, the alternate-interior angles are equal." We show how concise expression can be developed by building vocabularies. But the emphasis most characteristic to geometry is the development of the idea that a statement is not equivalent to its inverse or converse. We want the pupils to recognize that "If two angles of a triangle are equal the sides opposite them are equal," and "If two sides of a triangle are unequal, the angles opposite them are unequal," describe the same logical situation, but that they do not mean the same as "If two angles of a triangle are unequal, the sides opposite them are unequal." We want them to understand why this is true so thoroughly that they can apply the same principles in all their reading, non-mathematical as well as mathematical. Does the decision, "Anyone who is a registered Democrat will be allowed to vote in this election," imply that Republicans will not be allowed to vote, then? If you are not

a Republican does it tell whether you can vote? Does the decision imply anything about those who were not allowed to vote? No one can read or think clearly until he understands precisely what a sentence does or does not imply, unless he recognizes which sentences express the same thought and which do not.

If mathematics is "the science of necessary conclusions," we come to the heart of it in study of the syllogism. The bulk of the course is here; this is the bull's-eye part of our target. We often say we are developing ability to evaluate an argument. This ability comes when the pupil knows how to determine whether the evidence provided is sufficient for proof. In deductive thinking there is a necessary conclusion under two conditions:

1. We agree that if certain conditions are satisfied there is always a concomitant result. In abstract form we might say that we agree on a major premise: If A is B then C is D.

2. We produce evidence that the required conditions are present. By hundreds of applications to the content of geometry, we try to get across the principle that "A is B" is evidence that is pertinent to the argument and with our agreement implies a conclusion. Of evidence that "A is not B" or that "C is D" they should learn to sing with the operetta: "The flowers that bloom in the spring, tra-la, have nothing to do with the case."

It should be repeated that our drill is with fact of geometry. The goal is to understand this pattern of thinking and to recognize it as valid in every field where deductive reasoning is applicable.

Also of major importance in our teaching is development of an understanding of the nature of a logical system. In a logical system we start with undefined terms and unproved assumptions, and by combining them in ways of logic we reach new conclusions. Since the development of non-Euclidean geometry, we have a new understanding of what we have accomplished when we prove something. We realize now that, when we prove a fact, we do not so much prove that it is *true* in the accepted sense. Rather we prove that it is *implied* by our original assumptions and definitions; we prove that a fact is true *if* they are true. This concept is important to us in our thinking. In the first place it shows the futility of two people or two nations arguing or reasoning on a subject until they agree on the meaning of the terms they use and on some basic principles underlying the question. It shows that logically correct conclusions are not necessarily true conclusions. The Russian with one concept of Democracy and the American with another will not necessarily come to the same conclusions about it even if they both "think straight." Two religions may be equally logical but come to different conclusions because their basic faiths differ. This concept also provides the scientist with some test for his assumptions about the ultimate nature of the universe, for if the logical implications of those assumptions are not consistent with what he observes, he knows his assumptions are wrong.

(Not, unfortunately, that his assumptions are necessarily correct if they lead to conclusions consistent with nature.) Here again we develop this principle by showing how variation of assumptions and definitions in geometry affect conclusions, but the goal is to understand that it is a characteristic of all logical systems.

Most courses in demonstrative geometry also include attention to indirect proof. (This method of proving that a fact is true by showing that all other possibilities are wrong is one that we apply in our everyday thinking as when we determine what to do by eliminating what we should not do.) If we use it as a mode of thinking, we should understand the conditions under which it is valid to use it and conditions under which we can draw a conclusion.

Strangely, since we no longer expect or allow students to memorize proofs, we still hope that geometry can help to develop a logical memory. The psychologists believe that it is easier to learn something new if it is connected with other experiences. We know that it is easier to remember a fact if we know why it is true.

Running through all this discussion of aims connected with logic is the repeated emphasis that we should, to use the old-fashioned term, "teach for transfer." I prefer to think of this not as transfer from one subject to another but as considering the principles of logic as being so general that they are a part of all thinking. We use geometry as subject matter about which to reason partly because one cannot reason except by using some subject matter—and this is one that is worth knowing; and we use it partly because the possibility of exact definition and assumption and the absence of emotional content makes it ideal material for the beginner to use. But through all the details we should keep in mind that we want attitudes and habits of thinking broad enough to affect the way we reach conclusions. We want an inquiring habit of mind; we want the habit of searching for and recognizing the casual elements of a situation; we want average citizens trained in logical processes and knowledge of what constitutes a proof; we want ability to examine evidence impartially; we want to avoid over generalization; and we want to be able to interpret accurately what we read and state exactly what we mean.

Geometry has cultural and recreational values recognized by every teacher who loves it enough to want to teach it. Increasingly, we find teachers expecting the members of their classes to share these values. Not all will find in the subject the basis of a hobby, a life-time interest, but some will. Many of the great discoveries of mathematics in the past have been made by amateurs, and there are still many who find a lasting interest in such things as trisection of the angle or proof of some fact. There are still more who experience real mental pleasure in doing the work of the course. Beauty is "perfection that gives mental pleasure." A perfect proof is a delight to one

who understands it. Archimedes requested that figures of a cylinder and a sphere be inscribed on his tombstone in memory of one of his discoveries. The discovery of a fact, the sense of accomplishment from proving it, the creation of a useable model are sources of genuine pleasure. Every student should be expected to develop an increasing awareness and appreciation of geometric design as it occurs in his immediate environment—in nature, in art, in industry. Every student of geometry should develop appreciation of the cultural and practical contribution the subject has made to the advance of civilization. The story of how our knowledge of form and size and of the properties of figures in space have been applied in science and how they have affected modern industry is as interesting and important to our understanding of the world as political history. Nor should we discount the cultural value of a healthy respect for facts that have been examined and tested, of respect for questions settled by examining evidence impartially, openmindedly, without regard for personal feeling, of respect for understanding rather than mechanical performance.

One other aspect of geometry should not be ignored. It is a foundation and a tool for many later occupations. In an age of expanding technical fields, in an age when industry cannot begin to find enough scientifically trained men or enough engineers, we find that geometry is an important part of *such* training. It is needed by all who do research or teaching in physics or mathematics; it is needed by all prospective engineers, by workers with radio or television, by various skilled trades such as drafting, machine tool design, sheet metal workers, and many other shop workers. Many boys have studied the subject without knowing that they would ever be in the armed forces or that their advancement in such fields as navigation, artillery, and such specialized fields would be dependent on their knowledge of mathematics, including geometry. It is unwise to assume that skills will not be used. We should not teach geometry only to satisfy college entrance requirements. It has intrinsic values which make the study worth while to many a good student who never goes to college. But undoubtedly even if a pupil enters a college where it is not an entrance requirement, he will be barred from some fields of study in that college if he has not studied geometry.

There are many ways that geometry can be correlated with algebra. Some of the proofs are simplified by use of algebraic notation. Many of the theorems of geometry can be expressed in formulas. Use of these formulas provides further drill on the very fundamentals of algebra and arithmetic that are most often used as tools in the sciences and in industry. The formulas can also be used for developing more skill in quantitative interpretation.

Geometry teaches useful facts and our goal is that pupils should understand their applications, use them as tools in measuring or understanding, use them as preparation for later study or vocations. Geometry has cultural and

recreational values which should make us better able to understand and appreciate the world around us. Most important of all, geometry teaches techniques of clear thinking and precise expression that are applicable to all fields of thought and develops the ability to weigh an argument critically and and impartially which is useful to every intelligent citizen.

Since geometry is an ever-expanding, ever-unfolding branch of mathematics and forms an important part of the background of research in mathematical analysis, topology, applied mathematics, and other very active phases of modern mathematical and physical research, it is not unreasonable to think that one of the goals of geometry is to awaken a lifelong interest in mathematics in some high-school pupils that will lead eventually to the Ph.D. degree and into an active, vigorous, and fruitful life in mathematics teaching and research. It is good to assay the goals in geometry at intervals. It is also good to find that these goals have changed with the changing tempo of our world and of everyday life about us, and that alert mathematics teachers have kept well in the forefront of the demands of our contemporary civilization.

Chapter II.

Vocational and Professional Opportunities

A. VOCATIONAL OPPORTUNITIES IN MATHEMATICS

Irvin H. Brune

CHANGE IS THE ESSENCE

MODERN life continually grows more complicated. Duties within occupations change and whole industries shift. Blacksmiths, as one example, become scarcer, but servicemen for electronic devices become more numerous. In a welter of changes in occupations and rises and declines of specific, highly specialized jobs, no one can predict precisely just what kinds of problems each high-school graduate will eventually face. This holds in spite of greatly increased know-how in vocational guidance.

Fortunately, however, many of the mathematical competencies [1] needed by everyone for everyday living serve well also in a host of occupations. Consequently, many secondary schools require general and/or consumer mathematics in grades 7, 8, 9, and 12. These courses properly planned and ably taught serve as minimum foundations in mathematical understandings for many kinds of work. Accompanying this program nearly all high schools have still another sequence of courses. This latter work helps pupils understand the concepts of algebra, geometry, trigonometry, and so on needed by pupils who plan post-high-school training.

Obviously, the sooner pupils choose their life work and the surer they are in their choices, the easier it is for those who offer them academic counsel. But America's shifts in occupations, today's mobility of population, and people's penchants for trying something new—all strongly indicate that general education rather than hasty specialization needs emphasis. Change is in the air. New situations teach new responsibilities. High-school programs in mathematics need flexibility.

It is good practice, for example, for teachers to tailor courses to fit individual pupils. Suppose that a pupil's educational requirements, set up

[1] See first reference at end of this article for checklist.

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by the profession rather than by the school, include algebra and/or geometry. Yet pupil and teacher may both recognize that the pupil who is not planning to be a mathematician doesn't need these courses. Instead, the pupil needs some mathematics as a way of thinking in a life work. (The profession of nursing might illustrate such a situation.) Clearly the solution would be to make selections among topics in mathematics. The teacher would thus be helping the pupil in his calling rather than requiring him to be competent in exactly the same items as all other pupils. Useful knowledge is more important than labels of courses.

SKILLED WORKERS

Some high schools, usually the large ones, augment as well as alter the double program previously described. They offer statistics, shop mathematics, business mathematics, agricultural mathematics, trade mathematics, and so on. The aims of such courses are vocational; and the better a skilled worker understands mathematics, the better his chances of succeeding are. Indeed, promotions in his field come to the person who has ideas. Hence the worker might well study other mathematics too, including work often classified as preparation for college. Genuine leaders tend to have broad understandings.

However, many bookkeepers, clerical workers, craftsmen, farmers, nurses, and the numerous kindred artisans regarded and respected as skilled workers have studied less than four years of high-school mathematics. Surely all need general mathematics in grades 7, 8, 9, and 12; and surely many wish that they had learned more mathematics than they did. Indeed, many have to learn more mathematics on the job. They discover that accuracy in calculating and precision in measurement are especially necessary. Mistakes in one's personal affairs may irk one, but mistakes on the job may cost the individual his job.

Opportunities for employment for skilled workers are plentiful. A prosperous, growing nation needs labor replacements and additions continually. Skilled workers make up a sizeable share of our total population; apparently our economy will always need them. And understanding mathematics might help pupils avoid blind-alley jobs.

ENGINEERING

To qualify for engineering a person should like and succeed in mathematics and physical sciences. Engineers apply scientific and mathematical discoveries to designing, constructing, and improving materials, structures, and machines. They steadfastly seek better methods, better operations, and better products.

Engineers belong to one of the largest and fastest growing professional groups. From 30,000 engineers in 1890 to 245,000 in 1940 represents a big increase. But note that in 1950 there were 500,000 engineers!

The nation needs many more engineers. The present shortage runs about 40,000. And 30,000 annually will be needed for the next several years, unless all-out war occurs. In that event the need would sharply rise. Apparently the number of engineers to be graduated in 1954 will be about 19,000, and there is some doubt that the number of graduating engineers will reach 30,000 before 1963. By then, of course, the demand will probably have increased too.

Pupils who plan to become engineers should set high standards for themselves. They need not only all the mathematics and science offered, but also all the balanced background of general knowledge they can get. They certainly need aptitude, training, and important personal qualifications. They need good work habits, including accuracy, thoroughness, initiative, imagination, co-operation. They build ideas as well as machines. They must solve problems completely and correctly. They have to work well with other people. Veritably, quality underlies success in engineering.

Hence for engineers excellence of education is a *sine qua non*. Even those pupils planning to study engineering five years (there is a trend toward five-year programs in engineering) should not plan to make up high-school work in college. It is far better to learn thoroughly high-school mathematics including trigonometry before beginning college work.

Truly the demands in preparing for engineering loom large. But the rewards mount up too. The average starting salary for June, 1953, engineering graduates from one institution was $362 per month. And capable engineers receive rather rapid raises. So though qualifications are strict and preparations arduous, engineers like their work and enjoy excellent compensations.

ACCOUNTING

Accountants record, analyze, and interpret transactions in business. Any successful firm maintains accurate records. These the accountant directs and inspects. From them he determines the success of the business. From them he discerns tendencies and indicates probable trends. He must appraise the assets of his organization, computing their present values and allowing for depreciations. He calculates funds for retiring debts, paying taxes, and providing pensions. He studies costs, prepares budgets, and even explains discrepancies between estimated outcomes and actual results.

Obviously an accountant is not exactly a mathematician, but he does manifest a finesse for figures. He necessarily understands business procedures, finance, economics, business law, taxations, insurance, investments, and so on. He deals primarily with specialized arithmetic and the mathematics of finance. And whatsoever more mathematics he can fit into his program of education, he will find helpful in analyzing and solving the problems he encounters.

Modern business grows in size and complexity. This means, among many other things, that more and more accountants are needed. In 1900 only seven

colleges and universities provided programs in accounting. In 1951 the institutions offering such work increased to 153, and the trend isn't likely to cease soon.

As problems in accounting multiply, more and more accountants enter into public accounting. Here they consult individuals and corporations about many kinds of problems, including especially income-tax matters. Practitioners in public accounting combine experience and extensive education to qualify themselves as certified public accountants. The requirements, of course, are rigorous, but certified public accountants command excellent salaries.

During the years since 1900 certified public accountants have grown in numbers from about 250 to somewhere around 45,000. More important than these figurse, however, was the rate of increase. In 1951 there were more than twice as many certified public accountants as there were in 1940

ACTUARIAL WORK

Actuaries determine the rates insurance companies charge. By analyzing data that their companies collect continually, these mathematicians calculate the premiums people should pay for insuring items that are insurable. Essentially, insurance companies collect premiums from many people and compensate those particular insured people who suffer losses. Naturally the premiums that companies charge must suffice. Usually the companies invest those premiums and the premiums accrue sufficiently to cover whatever claims the customers submit. But insurance companies compete for the public's business. Hence actuaries necessarily determine rates that are at the same time adequate for meeting claims and reasonable, relative to charges made by competing companies. Of course, all successful companies include operating costs and profits in their charges.

The inferences that actuaries make require a high order of ability and education. Actuaries have to be proficient. Their preparation requires extensive and intensive work in mathematics. Frequently they need special training beyond their preparation in a university. The companies sometimes provide this extra education. And, through their own two professional societies, actuaries must pass a series of eight examinations before they become fully qualified.

Indeed, actuaries represent a select few among applied mathematicians. There are only 1,000 or so of them in the entire country. Most of them work for insurance companies, but Federal agencies also employ some, as well as private organizations, which require actual consultants in matters of pensions, health-and-accident benefits, and so on.

Actuaries make up one of the very few occupational groups that could place fifty per cent more members if they had them. Truly the pieparation is formidable, but those who qualify will not lack for a rewarding lifework.

INDUSTRY

People with many degrees of proficiency in mathematics find employment in industry. Bookkeepers, clerks, salesmen, machine operators, and many others find the mathematics they learned in high school indispensable. Computers, including coders and programmers who arrange the steps in the work, use machines that obtain results quickly. But these workers, nevertheless, find college mathematics helpful as they analyze and set up the operations which the machines carry out. Engineers, chemists, physicists, biologists, geologists, metallurgists, and so on in industry need considerable mathematics in their work. They rely heavily on the knowledge they gained in high school and in college. Operations analysts, statistics, and quality-control personnel usually require graduate-level mathematics.

So people using mathematics in industry are numerous. Yet full-time professional mathematicians in industry are relatively few. And they have found their places in industry rather recently. Nevertheless, they meet an important need there.

Professional mathematicians in industry serve as consultants. Not infrequently problems arise which require mathematics beyond the usual preparation of industrial scientists, engineers, and technicians. So these people seek the advice of consulting mathematicians. The latter have the know-how, the imagination, the ingenuity to cope with unusual problems. To formulate those problems, to find appropriate mathematical models resembling the conditions in those problems, and to design experiments to test hypotheses pertaining to those problems are proper tasks for only the highly trained mathematician. He needs to have at least a doctorate in mathematics. He is an applied mathmatician *par excellence*.

Industry can afford to pay well the people who solve its problems. And, as this brief discussion suggests, industrial problems range widely in difficulty. But none ignorant of all mathematics may enter this rich field of endeavor. And the better one's training is, the better the situation one should be able to fill.

STATISTICS

Research enhances modern living and serious students are working for improvements in many fields. Farmers seek better ways to produce crops, milk, and livestock. Teachers strive to improve their teaching. Industry betters its products steadily. Social scientists work steadfastly on eugenics and euthenics. Alert people in all walks of life accept research as necessary for efficiency and growth.

Researchers in most fields either use statistical methods or consult with professional statisticians. Accordingly, there is a growing demand for mathematical statisticians, who develop basic theory, and for applied statisticians,

who apply the theory to many fields. All statisticians, of course, need training in mathematics.

Since new applications appear continually, it would be futile to try to enumerate all the applications of modern statistics. Instead, we shall mention only a few examples in the next few paragraphs. Millions of people have their wages tied to a cost-of-living index prepared by the Bureau of Labor Statistics. Doubtless such an application patently illustrates the importance of statistics.

Next let us mention a problem in mass production. Statisticians in many industries set up sampling procedures for inspecting units selected from the assembly lines (statistical quality control). If a specified number of items fail to meet requirements, the faulty machine can be located and corrected.

Statisticians also set up sampling procedures to help purchasing agents to decide whether to accept or reject large lots of merchandise. In agriculture, statisticians help farmers to decide whether specific treatments enhance yield; they determine whether gains in production can be attributed to a particular treatment or to chance. In education, statisticians often help teachers to set up experiments designed to reveal within a fixed degree of assurance whether method A is better than method B. Similarly in psychology, sociology, economics, anthropology, government, and other social sciences skilled statisticians devise ways to collect data and make valid inferences therefrom.

Examples need not be multiplied. Implications for pupils and their advisers stand out clearly. In an age of science, research, and statistics, pupils need preparation in mathematics. Likewise, they need courses in elementary statistics. Above all, it is fallacious for pupils to assume that, since they like social studies, they can skip courses in mathematics. Rather they should realize that, to succeed in those studies, they soundly need mathematics, especially statistics. Indeed, all pupils should bear in mind that even the comprehension of much that one reads in newspapers and magazines depends on one's understanding of statistical concepts.

The embryo professional statistician, of course, should absorb all the mathematics his school and college offer. Knowledge in a second field wherein he might apply the statistics he masters would naturally be a wise objective, too.

The demand for people with statistical training grows apace. This is especially true in mathematical statistics, quality control, and social science. Here are fertile fields, and the qualified people who will work in them will be today's pupils who choose to pursue mathematics.

RESEARCH IN SCIENCE

Scientific researchers need to know statistical procedures. But they also need to know other mathematical concepts and their applications. Engineers,

physicists, chemists, biologists, geologists, astronomers, architects, and so on use mathematics regularly in their work.

During the past quarter century scientists in industry, government, and research foundations have increased greatly in number. And the demand for them continues to grow. The following table shows the pattern of employment for scientists.

SCIENTIST POPULATION BY SPECIALTY AND PLACE OF EMPLOYMENT, 1953

Specialty	*Federal Government*	*Colleges and Universities*	*Private Industry*	*Total*
Engineering	90,000	10,000	300,000	400,000
Chemistry	17,000	7,000	61,000	85,000
Physics	3,500	4,000	4,500	12,000
Geology	1,500	1,000	9,500	12,000
Biology (30,000 total); Medical sciences (5,000 total); Agricultural sciences (15,000 total)	18,000	24,000	8,000	50,000
Other natural sciences	5,000	8,000	3,000	16,000
Total	135,000	54,000	386,000	575,000

Most engineers engage in some kind of research. Accordingly, about four fifths of their total number listed in the section on engineering were included in the foregoing table. And just as the section on engineering indicated the rapid growth of engineering as a profession, so we can cite figures here to show how scientific workers, exclusive of engineers, in industrial laboratories have recently increased. In 1946 there were about 55,000 scientists in industrial laboratories. In 1950 there were about 71,000, and today, there are at least 86,000. Other places of employment have had comparably increasing needs for scientific researchers.

Leaders in scientific research projects need extensive training in their specialties and in mathematics. There are also many openings for clerks, computers, aids, and assistants. These positions usually require less specialized training and less training in mathematics; but the full program of high-school mathematics—arithmetic, algebra, geometry, and trigonometry—is the minimum for any such worker. And, of course, further education in science and mathematics prepares the assistants for promotions to positions having greater responsibilities and higher salaries.

GOVERNMENT

A host of government jobs closely parallels the vocational opportunities in private business, industry, and research foundations. To explain all the technical positions in government would be to repeat the preceding paragraphs in this chapter. The Federal government employs every type of mathematical worker we have mentioned, and state and local positions also provide many opportunities for employment. The Federal government hires people through the U. S. Civil Service Commission. Figures for later than June 30, 1951, are not available. But at that time the following groups of people were employed by the Federal government in mathematics:

Actuary	49
Actuarial clerical	368
Mathematics	1,249
Statistics	2,038
Statistical clerical	9,750
Statistical coding	1,672
Statistical drafting	457
Cryptography	1,111
Cryptanalysis	411
Cryptographic clerical	1,185
	18,290

Besides the foregoing, of course, there are many other positions for scientific researchers, as mentioned in the section on research in science. There are also many accountants employed through state and Federal civil service. Pupils interested in government jobs should keep in touch with materials furnished by the Civil Service Commission, Washington, D. C. And they should prepare themselves by thorough study in high school and college.

Some civil service jobs are filled by competitive examinations; placement in others depends on ratings based on education and experience. There are several classifications of positions, with salaries varying considerably according to the nature of the work. Clerk, junior scientist (mathematical), mathematician, and statistician are titles of some of the classifications in government service.

Juniors in college may enter the employ of the government *via* summer positions that can become permanent positions after graduation. To become elegible for the summer jobs, the students must pass Government Student Aid Examinations. This plan affords the students summer on-the-job training at $3,175 per annum (1953 rate), plus the opportunity to qualify for full-time professional positions when they are graduated from college.

Government jobs compare favorable with many of the activities maintained by private industry. There is legally protected security in the job. Although there is some red tape resulting from the size of government projects, working conditions tend to be good. There is variety resulting from the wise scope of government undertakings. As in industry, those who produce receive good pay.

NATIONAL DEFENSE

Service in the armed forces will interrupt the vocational training of many young people now in high school. Most of these young men and women will want such a vocational break to be slight. If at all possible, they will prefer that the service they contribute to their country also contribute to their ultimate plans for a career. And, to some extent, this is possible.

During World War II we learned as a nation that many civilian defense jobs and many assignments in the armed forces require similar skills and knowledges. It was also rather unpleasant to realize at that time that many of our citizens lacked the mathematics they needed either in military situations or in industrial efforts. Advisers of high-school pupils should be very reluctant to let mathematical deficiencies again handicap our defenses in the event that another martial conflagration develops. Pupils who avoid courses in mathematics simply do not fill the defense bill.

In organizations as huge as the armed forces, some individuals initially receive assignments for which they are ill suited. This happens despite the fact that classification officers carefully ascertain the aptitude, training, and experience of every recruit. However, as far as quotas permit them so to do, they try to fit people to jobs. Sometimes, moreover, reassignments become necessary, and misplaced personnel can be better placed. Eventually the people with the qualifications get the responsible posts.

To appreciate how important mathematics is in the Air Force, Army, Marine Corps, and Navy, one needs only to note the number of career fields in each that require mathematics: 33 in the Air Force; 25 in the Army; 28 in the Marine Corps; and 12 in the Navy. Each of these fields includes numerous divisions of labor and specialties in it. Pupils and advisers can find details about service jobs in the occupational handbooks furnished by the several branches of the armed services through their recruiting officers.

TEACHING

Teachers constitute a large group among those who use mathematics. People in the profession and, more recently, people outside the profession have felt the stresses caused by a notable shortage of teachers. As is well known, population bulges in most communities currently overfill the elementary grades, and future first grades will continue to be large. So our present 680,000

elementary teachers will need reinforcements. Many of these new teachers will teach arithmetic. In departmentalized schools, specialists in arithmetic will be in greater demand than ever.

And in due time, the high schools will need considerably more teachers. By 1960 the high schools will require three teachers for every two who served in 1950. Besides, junior colleges and colleges should also eventually experience increased enrollments.

RESEARCH IN MATHEMATICS

Any consideration of college teaching in mathematics must also mention research. College teachers usually are productive mathematicians, and university progressors consider research to be the most important part of their work. For universities not only disseminate knowledge; they also extend knowledge; they search into the unknown.

Pure mathematicians experiment with mathematical laws and principles mostly to see what develops. They are unusually curious; they reap great satisfaction from their work. Their results fascinate them, and they little care whether those results can be applied to practical problems. The results are valid; that is what matters. The concern is not with utility, but with logic.

Frequently, however, the results of research do have applications. But, regardless of its applicability to practical affairs, research in mathematics has to go on. Were it not for its continued growth, mathematics would soon lose its vitality. Eventually science and invention would suffer for want of adequate mathematics to solve the endless problems arising in scientific research, and modern life would suffer and stagnate.

Apart from the researches pure mathematicians pursue, other workers, known as applied mathematicians, carry on a never-ending search for mathematical models to help them solve many problems in business, industry, government, insurance, sociology, economics, and the sciences. Usually the pure mathematicians have constructed or can construct the mathematics, and the applied mathematicians work out the applications of it.

As modern life grows more and more complicated, mathematical research must continue at an accelerated pace. There is a continuing need for more and more research people. Within recent years many of these scholars have come to us from foreign countries; our own supply of young research people has appeared to be inadequate. Does public education fail to develop the gifted pupils to their fullest possibilities? Here are unusual challenges to our schools and unusual opportunities for rewarding, satisfying careers for brilliant people who now attend our schools. It is to be hoped that their teachers recognize them as exceptional pupils and encourage them as potential intellectuals. Truly, all our people owe much to the few who blaze trails into the great mathematical unknown.

THE OUTLOOK FOR PEOPLE WHO KNOW MATHEMATICS

Alert pupils certainly will not overlook mathematics when they choose their courses. Even a cursory survey of employment opportunities for those who understand and can apply mathematics reveals a wealth of possibilities. All consumers need some mathematics, and nearly all occupations require at least a modicum of it. In our highly scientific age more and more vocations demand more and more mathematics. And in most of the trades and professions considered in this chapter, young people can reap rich rewards (not necessarily financial reward) *if* they know mathematics.

Let us not overlook that *if*. All too frequently pupils flit from one academic bush to another, skipping mathematics because someone—a parent, a friend, or an overworked adviser—intimated that mathematics is abstruse, or useless, or passé. Later, in fact, often too late, many of these same pupils encounter an opportunity for which they are unprepared. A new job, a promotion, or a new development in one's trade appears—but it requires mathematics. Under such circumstances many have to forego the opportunity; others seek rather frantically to "catch up" by correspondence courses or by attempting to take college courses without the necessary background; and a few, by extraordinary persistence, do make the adjustment.

Obviously, the time to acquire essential mathematical understandings is in high school. The opportunities abound, if the young person has the mathematics. A similar statement applies to work in the sciences.

In the present chapter no distinction was made between opportunities for boys and opportunities for girls. The point there is that ability, proficiency, and excellence of education are the items that matter, regardless of the sex of the applicant. Should this assumption seem unwarranted, the fact still remains that capable women do accept and hold responsible positions. So possibly we ought to emphasize excellence, and let employer prejudices gradually dissipate.

Also in the present chapter the quoting of exact salaries was rather studiously avoided. Here the big reason is change. Who can predict civil service salaries for, say, 1960? Accurate reports of present-day salaries have a nasty way of quickly becoming inaccurate, and absolute salaries distort details in the employment picture.

A FEW REFERENCES

The following publications give a more detailed account of vocational opportunities in mathematics:

Guidance Pamphlet in Mathematics for High School Students. National Council of Teachers of Mathematics, 1201 Sixteenth Street, N. W., Washington 6, D. C.

Math at General Electric. Dept. 2-119, General Electric Company, 1 River Road, Schenectady 5, New York.

Mathematics for All High School Youth. State Education Department, Albany, New York.

"Professional Opportunities in Mathematics." *The American Mathematical Monthly* 58:1 (January, 1951) pages 1-24.

Why Study Mathematics? The Canadian Mathematical Congress, Engineering Building, McGill University, Montreal, Canada.

B. MATHEMATICS AND THE NEEDS OF INDUSTRY

NEIL B. REYNOLDS

THERE are two ways to assess industry's needs for a mathematically literate public. One is short-range; the other, long-range. Fortunately, both lead to substantially the same conclusions.

It seems scarcely necessary to catalog the industrial jobs that call for the highest levels of mathematical understanding and proficiency. The recruiting teams which have been calling at college campuses for the past few years have these lists; I presume most guidance teachers have them, too. Though the exact names of the jobs will vary with the nature of a company's business, most will fall in the categories embraced by engineering—aeronautical, chemical, electronic and electrical, mechanical, metallurgical, and so on. If you look for a common denominator, it will be found in the basic courses in mathematics, both fundamental and applied, which the students have taken in acquiring their respective degrees. And essentially the same common denominator will be found in those fields usually called "the sciences": chemistry, metallurgy, physics.

As nearly everyone knows, there has been for the past few years a seller's market in technical manpower. In the recruiting trade there have been—under cover, of course—weekly if not daily quotations on what leading companies were offering in the way of starting salaries for even moderately qualified graduates with engineering degrees. Some prophets have been saying: It can't last. But can it?

There seems nothing in sight, short of a major and crippling depression, that would call a definite halt to the continuing need for competent technical personnel in the major industries of the country. Statisticians have traced an upward curve for the engineering content in that mysterious and potent super-statistic called the Gross National Product. That curve is still climbing—only one evidence that the world's jobs are becoming more mathematical, not less so. Others range from the growing importance in both our defense and peacetime economy of the equation $e = mc^2$ to the number of people who, on March 15, struggle with the arithmetical computations of Form 1040.

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Many factors, of course, have contributed to produce the seller's market in technical graduates. One—the low birth rate in the 1930's—is certainly a temporary phenomenon, and the bulge in the school curve which is beginning to show at the lower edge of the secondary schools will, in time, help to correct this deficiency. But will it be enough?

That question marks the dividing line between the short-range and the long-range problem. For pure numerical quantity—or more strictly, potential quantity—is no guarantee of an adequate supply of trained manpower to meet the needs of our economy a decade or two hence.

A few years ago, the people of my company participated with national engineering societies, various associations representing education, and government agencies in making a survey of the problem. They studied population charts; they talked to engineering deans; then they took a look at secondary-school curricula. What they found was not reassuring.

For one thing, they found a sizable proportion of boys (and I suppose just as many girls) reaching the college entrance age with only the sketchiest idea of what they wanted to do. If their bent was toward science and engineering, they faced in the colleges—and rightly—some fairly stringent mathematics entrance requirements. All too often, the courses these youngsters had taken in their secondary schools had not prepared them—or at least not prepared them well—for those entrance requirements. And the time they should have been aware of these basic mathematics needs was not half way through high school but back in the junior high-school years.

So, two facts seemed to stand out. One was that there were, among pupils, honest doubts about the opportunities and attractiveness of careers in science and engineering. And second, a sizable percentage of pupils in secondary school were not taking the courses in mathematics which would allow them to enter science and engineering courses in college if they should want to when the time came.

Here then, it seemed, were two areas in which industry could legitimately lend a hand by making available information which—probably in our self-centered innocence—we had assumed was reasonably common knowledge. We could put down, as honestly as we knew how, the facts about careers in engineering and science as we observed and could predict them in our own business. Then we could point out that it was only wishful thinking to aim at these careers without at the same time taking the necessary courses in mathematics and working hard at them.

We set ourselves some working rules. We wouldn't just beat the drums for an engineering education for everybody. Science and engineering, as we well know, are not the proper careers for everybody; and there are a multitude of equally important jobs, with equally exacting non-technical requirements, for which we are just as anxious to attract applicants. But

out of General Electric experience we could show what kind of jobs engineers could expect, what sort of work they would be doing, and that—in our company at least—engineering had been good training for eventual careers in a wide variety of managerial positions. This would be an antidote for the "dime a dozen" philosophy which had been current in the late 1940's.

Neither would we prescribe mathematics as a panacea for all educational ills. *What* should be taught in the schools, and *how* it should be taught—these were clearly outside our proper sphere. But we could offer, from General Electric experience, some testimony as to the utility of mathematics.

In the spring of 1952 we prepared a four-page editorial-type advertising insert for the *Scholastic* group of magazines. It was called "General Electric Looks at Engineering Tomorrow." Its theme was that science and engineering offer enjoyable challenges to capable people, that they offer some of the greatest opportunities for service, and that the trend in the world is for greater opportunities tomorrow. We estimate that as many as three million pupils saw this message. As to the number who actually read it through, we have, of course, no measure.

A year later we took the second step. Also in *Scholastic,* in March, 1953, appeared an article by C. H. Lang, our vice president for public relations. Mr. Lang was, and still is, chairman of the Advertising Council's Technical Manpower Committee. The article was entitled "Why Study Math?" It was then amplified and put in booklet form with the same title. At the same time we issued a companion booklet, *Math at General Electric*. It gives twenty-two problems, with their solutions, that are actually encountered in the course of their work by people in the company holding twenty-two widely diverse positions. Both booklets were offered free to secondary-school mathematics teachers for use in their classes.

Lastly, in September, 1953, we mentioned the existence of these booklets, and our reason for issuing them, in institutional advertising in a small list of opinion magazines. I hope I do not sound too boastful in reporting that the response has quite overwhelmed us. Requests for *Why Study Math?* now total somewhere around a million and a half copies. But more significant than pure statistics have been the letters. The refrain from teachers has been: "That is what I have been trying to tell my pupils—that mathematics is important and useful. They won't listen to me because I am just the teacher boosting her own subject. But they will believe the testimony of an industry like yours."

An equally challenging response came as a result of the advertisement. Apparently a sizably group of American parents would like to see their children have a better, not a poorer, grounding in mathematics than they had. And they welcome testimony from General Electric that algebra, geometry, trigonometry, and calculus are useful, if not essential, prerequisites for success

in a large proportion of the jobs the company will have to offer in the years ahead. It's not just parents, it's sisters and uncles. And one soldier from Korea wrote, "Please send a copy to my kid brother who is in junior high. . . ."

This case history may not in itself be very important. It is the story of one small program, undertaken by one company for what was, in part at least, a selfish motive—an attempt to increase the potential supply of trained technical personnel a decade hence. Perhaps we shall never be able to measure, definitely, what, if any, results come from it, though we do have a few straws: "From a meager enrollment of fifty math pupils, we now have over 125 in our high school." And: "The number of students enrolled in upper division math subjects for next year shows a gain of more than fifty per cent over the preceding year."

It may be that the most important thing we have learned is that industry has the continuing opportunity, and the obligation, to make very clear what kind of jobs it has to offer and what the educational requirements of those jobs will be. If so, it is not a new problem, or a new opportunity, but something which we in industry should have been doing all along. And if there are standards of mathematical literacy for industrial jobs, what about similar standards for such things as English or history? Perhaps here is a common meeting ground for the industry-education co-operation that appears on the schedules of so many conferences and symposia.

Back at the very beginning I used the expression "mathematical literacy." I have a strong personal belief that industry—and perhaps the whole economy—needs something from mathematics that may transcend in importance even the more spectacular contributions of advanced mathematics to advanced technology. This is a common quantitative language to "think in."

You may remember the story, true or apocryphal, about the only speech that Josiah Willard Gibbs ever made in a faculty meeting in his long tenure at Yale. It was just four words long: "Mathematics is a language." There are some types of thinking, and most certainly of communicating, that can best be done in terms of mathematical relationships.

An amazing number of ordinary concepts are essentially mathematical in nature. Take the functional relationships. Books on psychology, economics, and sociology are ordinarily fat and wordy. Paragraphs and sometimes chapters are devoted to trying to express complex qualitative relationships of forces and factors. Anyone who is accustomed to thinking in mathematical terms is tempted to summarize them with the simple expression $x = f(y, z)$. Similarly, long discussions of interrelationships cry aloud for the separation of dependent from independent variables.

Similarly, the concepts of orders of magnitude, infinities, infinitessimals, maxima, and minima—these can convey to the initiated ideas more concrete and explicit than the ones derived by a study of those words in the dictionary.

A wider understanding of mathematics might spare us the spectacle of statistics expressed in tenths of a per cent on data obtained by interviewing thirty-nine people. Or the advertising absurdity "a reduction of up to thirty per cent less. . . ."

These are little things, but they are signs of fuzzy thinking—and that means dangerous thinking. Perhaps there is a place somewhere for a scholarly study on mathematics as a vehicle—or at least a touchstone—of communication.

C. HIGH-SCHOOL-COLLEGE CO-OPERATION IN DETERMINING MATHEMATICS REQUIREMENTS

PHILLIP S. JONES

QUOTATIONS from a recent curriculum bulletin indicate two of the four basic problems of high school-college co-ordination in the field of mathematics. These are: "The specification by the colleges of certain high-school courses to be taken by all students seeking college entrance sets definite limitations to curriculum revision. . . ." and "In no case should the college be expected to establish programs at a pre-college level in order to develop in students those learnings that make for success in college." [1]

The third and fourth problems are those of providing for the needs of the nation and of the individual students. For the nation, progress in peace and defense and in science and society has never before been so closely allied with a supply of mathematically trained personnel capable of understanding, operating, and extending not only the notions of classical mathematics, but also new concepts and applications which are coming faster and faster. Since arguments of this type have appeared in many places and since data on the vocational aspects of mathematics have been presented elsewhere in this series of chapters, here we will merely name as an example of recently developed fields requiring collegiate mathematical background some of the short courses which were taught in the 1953 Summer Institute on Mathematics for Social Scientists sponsored by the Social Science Research Council: *sets and relations, probability including stochastic process, matrix theory, theory of games, linear programming, and mathematical models in the social sciences.* If psychology, economics, and sociology are moving into such mathematics (not merely statistics), how much more is now being

[1] *New College Admission Requirements Recommended. A Proposal for Co-operative Action by the Secondary Schools and Colleges in Illinois.* Circular Series A, No. 51, Illinois Secondary-School Curriculum Program, Bulletin No. 9, January, 1951, pp. 5, 6.

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demanded in engineering and the physical science—even at their more elementary levels! Not only must persons with abilities of this type be located, and interested, but also they must be properly guided in order that their development may be as efficient as possible. However, it is not high-pressure recruitment that is needed, but a sound program which helps individuals to progress as they are able and to discover fascinating interests and opportunities of which they may not even become aware if left entirely to their own devices.

In fact, one facet of these national—good and individual—welfare guidance problems is that few pupils, parents, and even counselors are fully aware of the number of college programs which require some preparatory (secondary-school level) mathematical background. Since few colleges now require high-school mathematics for admission, and even fewer require it for graduation, non-mathematicians lose sight of the fact that many special curricula within college can be pursued by mathematically unprepared students only after time and money are spent *upon* "make-up" work, if at all. Only careful and detailed reading of college catalogues will reveal all of these hidden requirements, but a recent series of studies in three midwestern states show that college curricula can be roughly divided into three categories: [2]

Class I. Mathematics not a prerequisite: English, foreign language, history, theology, music, art, physical education, and journalism. However, in one school students of journalism were required to study accounting and statistics; in another, those preparing for the ministry studied business and church architecture; while several departments of art recommended geometry.

Class II. College mathematics required (this, in general, implies some previous high-school work). Everyone recognizes that engineering and the sciences (even some areas of botany, zoology, and geology) fall into this category. Many would add business administration and agriculture. Perhaps fewer would include (as they should for a person majoring in the field) economics, forestry and conservation, psychology, sociology, public health, and architecture and design.

Class III. Mathematics required indirectly. These generally are curricula such as medicine, dentistry, medical technician, nursing, and pharmacy where mathematics is required implicitly as a prerequisite to the chemistry or physics which is listed explicitly. Hidden requirements even appear occasionally in such remote areas as dramatics (in connection with the physics required as a background for the study of stage lighting and sound amplification) and speech correction (in connection with the pre-medical work required as a basis for understanding speech abnormalities).

These prerequisites as well as those for collegiate mathematics courses are usually stated in terms of high-school algebra and geometry. This has been interpreted by some as a collegiate restriction on high-school curriculum experimentation. However, these words are merely convenient and customary titles derived from the high-school curriculum itself. The real desiderata are understanding of and some competence in several related areas of mathe-

[2] Edwards, P. D.; Jones, P. S., and Meserve, B. E., "Mathematical Preparation for College," *The Mathematics Teacher*. Vol. XLV, 1952, pp. 321-330. Copies are available at 15 cents each from the National Council of Teachers of Mathematics, 1201 Sixteenth Street, N. W., Washington 6, D. C.

matics. In what courses, carrying what titles, and at what grade level these are taught are irrelevant details to colleges as long as they are acquired by the students. In fact, several universities have recognized this explicitly. One engineering school, for example, has rephrased its graduation requirements in terms of competencies rather than hours of credit in mathematics. Another one, at least, has published a list of mathematical needs [3] and explicitly encouraged experimentation with a unified or integrated mathematics program in its own campus high school. Such programs should not "set a limitation to curriculum revision" but should stimulate it!

There will continue to be problems in this area, of course. General mathematics listed on a high-school transcript, with no explanation, will be suspect in itself and of little value to college counselors in their placement of students. This is because it has in so many schools, for so many years, meant mathematics of low quantity and quality for inept and disinterested students. It may be necessary to enclose a dittoed note with transcripts explaining that credit equivalent to algebra and geometry, and perhaps even more, was earned in an integrated course. Perhaps a summary outline of mathematics I, II, III, IV, were these the names of new courses, should be included with the transcript.

One must also admit that there is still pressure upon the high schools to teach some mathematics. In this, however, the college is merely the agency of our national, social, and individual needs which speak through course requirements.

Here we come to the problem posed by the second part of our initial quotation, "In no case should the college be expected to establish programs at a pre-college level. . . ." This is subject to both interpretation and debate. A number of colleges are now teaching begining high-school algebra and geometry; a few even give credit for these courses. In the latter cases, the student's total achievement upon graduation may be lessened by the time required for such elementary work, while if no credit is given, he will be burdened by additional work, or perhaps by summer session expenses. Less important than these disservices to our individual students, but still not negligible, are the burdens passed on to the colleges by such postponements. They must support and staff more classes, guide more students into more complicated sequences, and use the energies of hard-to-obtain collegiate teachers at levels of instruction for which their experience suits them less well while failing to utilize their specialized knowledge for advanced instruction and research.

All of this means that the essential elements of college preparatory mathematics should be highly recommended to all competent high-school

[3] *Mathematical Needs of Prospective Students at the College of Engineering at the University of Illinois*, Urbana, Illinois. University of Illinois Bulletin, Vol. 49, No. 9, September, 1951.

pupils—not merely to college preparatory pupils. This is true because more and more students change their minds about further study, and many who do go on are uncertain of their areas of major interest or change their minds after a period in college.

This recommendation, however, would be of doubtful value for the welfare of secondary-school students as a whole were it not for the fact that substantially all of one to two years of college preparatory work *can* be of both value and interest to such students. Please, however, note the italicized *can*. This is *not* a blanket recommendation of a year of algebra and a year of geometry for *all* high-school students, not even, unreservedly, for all competent non-college directed students. For such a recommendation to be valid, high-school teachers and administrators must accept a responsibility for revitalizing the content and methods used in these two years. *Meaningless* drill and *excessive* manipulation, wherever they exist, must give way to the teaching of significant mathematics for understanding and transfer. This teaching should emphasize the nature of logical reasoning and problem solving, and be accompanied by enrichment materials including genuine applications. This is a difficult ideal toward which to strive, but progress is being made. New syllabi stressing an integrated program which is cognizant of both the power and sequence of mathematics as well as the immediate and long-run needs of students are being developed, some with the very deep involvement of college departments, as in the Illinois project and the work of the School and College of Admission with Advanced Standing. However, new and radically changed courses are not the essential element in improvement of instruction. Alert, vigorous, and informed teachers are, within the classical course organization, trying with increasing success to teach for transfer by stressing understanding, applications, and interrelationships.

However taught, mathematics is essentially sequential, especially in its early stages. In fact, properly exploited, this is one of its educational values. It is the area above all others where lack of high-school preparation retards college progress both in the same field and in numerous related areas. Hence the extra importance in this area of proper counseling and of guaranteeing an opportunity to elect substantial mathematical work during one's high-school years.

Where double or even triple track programs can be maintained in mathematics at the ninth- (and perhaps tenth- and twelfth-) grade levels, there is much to be said for them, but such integrated courses as were suggested above may enable the small high school to offer ninth- and tenth-grade mathematics adequate for college preparatory students which also is functional for all others of at least normal competence. For later and more specialized college preparatory courses, the small school may make use of cycling of

courses in the eleventh and twelfth years as well as correspondence courses, preferably school financed and supervised.

By way of recommendations to administrators in regard to the mathematical preparation for college, we summarize as follows:

1. Be sure that counseling conveys to students a recognition of the increasing variety of areas of college study requiring some high-school level mathematical preparation, either implicitly or explicitly.

2. Assist and encourage teachers to revitalize the content, materials, and methods of mathematics teaching. Such help and encouragement may include providing: (a) money for teaching aids and materials; (b) time and expense money for attending conferences and working with committees studying such problems; (c) a teaching load which allows time for planning, experimentation, and evaluation; and (d) encouragement and moral support in such endeavors.

3. Provide a full mathematics program for interested and able students even in small schools, if necessary, by cycling courses and using correspondence study.

4. Encourage teachers to make a frontal attack upon the problem of recognizing, stimulating, and guiding the really superior student, a problem discussed in more detail elsewhere in this publication. However, advanced course work (*e.g., calculus*) for a very few should not be sought at the expense of a firm foundation in the understanding of basic concepts.

Chapter III.

Curriculum Problems

A. THE HIGH SCHOOL PRINCIPAL LOOKS AT THE MATHEMATICS PROGRAM

DONALD W. LENTZ

THE BLAST of an atomic bomb was virtually required to restore to mathematics and the physical sciences some of the prestige and value which had been lost during the past three or four decades. During that period, the high-school principal had viewed with varying degrees of alarm, apathy, or joy—depending upon the area of his interest—the increasing number of curricular offerings, the increasing heterogeneity of the high-school population, and the decreasing emphasis on the traditional mathematics program. As the number of offerings increased, less time was available for certain traditional courses; and mathematics, especially at the upper levels, was crowded to one side. Mathematicians and mathematics educationists had failed to prove value in their offerings, either to the public or to the administrators.

As the pupil population became more heterogeneous, a smaller percentage was able to achieve the rigid standards of the traditional program. At the same time, basic mathematical needs of these pupils were changing. Preparation for college became only one of several reasons for attending high school, and in many communities this reason became practically insignificant. To provide for these changing population needs, courses in vocational mathematics, general mathematics, consumer mathematics, and shop mathematics began to find places in the school program. Nebulous as some of these offerings were, many of them served highly useful purposes in their respective communities.

The principal found himself faced with a need to include in the school the courses designed for college preparation on the one hand, and the courses which are of a more "functional" nature—designed for immediate use, as it were, and anticipating the terminal properties of any particular grade in high school for the non-college-bound pupil. Thus, single-track, double-track, and even triple-track programs found their way into high-school programs, as efforts were made to meet pupil needs. Throughout this entire

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process, it should be recognized that the administration had to wrestle with serious problems of college entrance requirements, standards of accrediting associations, and demands of state departments of education.

Meanwhile, more and more pupils were being "guided" away from higher mathematics programs into other fields or into the nebulous and unsettled "general math" area. Colleges and universities were making adjustments in their mathematics requirements to accommodate the trend. Higher mathematics, although still on its pedestal, had lost many bidders and was fast becoming a museum piece. Then, the atom bomb and the startling revelation that the new age would find us short thousands of trained engineers and scientists, to say nothing of technicians; and the principal who had been striving to meet "consumer" needs was being challenged, "How come?"

NEED FOR JOINT PLANNING

How can the busy principals, especially the great number who must operate without the services of a curriculum director, keep abreast of rapid and significant changes such as those taking place in mathematics? There must be reliance on staff members—the people who should be expected to be in close touch with practices and trends in their respective subject areas.

While the principal should be expected to stimulate and guide the development of a worth-while mathematics program, mathematics teachers should, in turn, be expected to participate in the planning of such a program. Research, formal professional preparation, and participation in professional organizations are among the activities which will aid teachers to become co-planners. The principal can encourage such activities in anticipation of building a strong core of teachers who can assist him in the establishment of a suitable program. Extensive reading in subject matter fields will help the principal, of course, but there are time limitations and there must be reliance on subject matter specialists from the staff.

THE MATHEMATICS TEACHER

A joint planning program implies that there be a staff with an adequate mathematics background, at least. Unfortunately, most schools do not enjoy that advantage during the current shortage. Far too many mathematics teachers have "minors" in mathematics and their greatest interest is in other fields.

At the high-school level, especially, inertia, vested interests, lack of suitable material, inadequate definition of new courses, and similar problems seriously interfere with active participation and experimentation by many teachers who have had several years of experience—teachers who teach traditional courses very well and who could make valuable contributions to a growing program if they would.

One of the most serious problems faced by the administrator who seeks well-qualified mathematics teachers stems from the failure of teacher training institutions to train mathematics majors. Although the situation is being resolved in many universities, a controversy persists between the subject matter "purist" and the educationist. In institutions where this dichotomy exists, a student being trained in the "Education Department" finds it difficult to obtain the necessary courses from the "Mathematics Department" to attain a "major" in mathematics, nor will the mathematics department make its resources available to prospective teachers who are interested merely in improving their background in mathematics by taking some type of course that will help them to teach arithmetic with more confidence and efficiency. The tendency for young people, then, is to avoid the rigorous pure mathematics program entirely, or to embark on the mathematics program as part of an engineering or scientific course which, with the current market, takes the prospect from the teaching field. In view of the numerous instances of the successful combination of resources of departments, it would appear that the controversy between the academic professor and educationist can be overcome through the development of mutual understanding and co-operation. Various professional groups, including the Co-operation Committee on the Teaching of Science and Mathematics of the American Association for the Advancement of Science, are successfully attempting to minimize the differences between these groups. The net result should be an increased flow of better-trained mathematics and science teachers.

GRADES 7 AND 8 IN THE MATHEMATICS PROGRAM

More and more, administrators are coming to recognize the importance of the philosophy and curricular offerings in grades seven and eight. Regardless of the grade organization of the system, be it 6-3-3, 6-2-4, 6-6, 8-4 or some other combination, grades 7 and 8 appear to present unusual problems in many areas. Mathematics, or arithmetic as the case may be, presents its share of difficulties. To date, relatively little attention has been given to the significance of this period in the preparation of boys and girls for a mathematics program.

In many instances, grade 7 marks the beginning of a junior high school, or it is the first year in a six-year high school. Quite often, pupils in grade 7 of the new school are drawn from several elementary schools, with different standards, different arithmetic programs, and different teachers. These different pupils, with different backgrounds, thrown together in a mathematics class to sink or swim together, with a resulting settling to mediocrity if they do survive. Actually, nowhere is a program of arithmetic diagnosis needed more than here. The teacher must know the nature of the foundation before substantial building can be done.

With the highest respect for the work of elementary teachers who are often expected to be experts in everything from coat-buttoning to calculus and from ailments to algebra, many are not highly qualified to teach arithmetic, especially in the "meaning" sense. Where they are qualified, time limitations often stand in the way. Among the hard-working teachers is a group of emergency-certified teachers, with limited qualifications, who are performing an important service at this time. Their limitations in arithmetic teaching proficiency are often severe.

The implication is that seventh-grade teachers must examine their new charges closely to diagnose and offer remedial help, to assume very little, and to be prepared to take the pupils *where they are* before moving ahead.

Another important aspect of the seventh- and eight grade program is its role as the springboard into later grades. The junior high school has often been described as an exploratory school, but too often the exploration and stimulation is limited to special fields, such as music, art, industrial arts, and home economics. We have failed to capitalize on the opportunity to stimulate interest in many traditionally academic areas. In short, a living, dynamic mathematics program in grades 7 and 8 can do more to encourage apt youngsters to continue the study of mathematics than any other guidance technique—and a dull, unimaginative program can be a most effective deterrent.

Thus, the school administrator who would improve the high-school mathematics program would do well to examine the program in grades 7 and 8 with an eye toward a sound diagnostic and remedial program with flexibility enough to meet the various abilities and backgrounds of the pupils. At the same time, there should be an awareness of these grades as an exploratory period in mathematics.

GRADES 9 TO 12—MATHEMATICS FOR EVERYONE?

No attempt is made here to state detailed curricular offerings for grades 9 through 12 since this has been done well in other portions of this publication and in the recent yearbooks of the National Council of Teachers of Mathematics. However, it should be noted that the curricular trends in mathematics create puzzling problems for the principal who must prepare a schedule and enroll pupils in the various courses.

It appears that the traditional sequence from Algebra I through college algebra and trigonometry continues to prevail in most schools. To some degree, this is source of comfort and security to the harassed principal who can find some stability in this part of the mathematics program. But, who shall follow this sequential program? Who shall take Algebra I? Let's give an algebra aptitude test! If a pupil achieves a certain score, he is eligible and we'll counsel him into algebra. If he doesn't achieve, we'll guide him away. But, where shall we guide him? Are there other mathematics offerings?

Yes, there may be a general math course. Just what he needs (or just where our program needs him); but he *wants* to take algebra, his parents want him to take algebra, and so he takes algebra. Why? All too frequently the answer lies in the fact that few desire to be associated with a "dumbbell course" like general math. And so the principal must provide for means of interpreting the values and purposes of various offerings—not only to justify them, but also to stimulate pupil participation in them.

Fortunately, if the pupil survives Algebra I, he has a good chance of completing a mathematics program. On the other hand, inability to complete Algebra I satisfactorily can often be accepted by pupils and parents alike as evidence of lack of ability to continue further with more advanced courses. With the traditional sequence as a nucleus, administrators are constantly faced with the need to provide for those who cannot qualify or do not choose to pursue such a program, as well as for the gifted pupil who may be capable of producing far beyond the limits of the usual pattern.

GENERAL MATHEMATICS—IS IT RESPECTABLE?

General mathematics has one thing in common with the typical virus—if we could identify or define it, we could do something about it. Reference has been made to the nebulous nature of early courses and the "dumbbell" stigma that had been attached to them. Principals and department chairmen often carefully avoided instituting such courses because they were not clearly defined and because pupils tended to shy away from anything that belittled their intelligence.

Nevertheless, the heterogeneity of the high school and changing community needs stimulated the growth of such courses, making it possible for pupils to obtain the mathematics they might need as consumers and producers without having to resort to the rigorous and abstract traditional program. Some principals, in their zeal to climb aboard the "utilitarian" bandwagon, fostered mathematics courses designed for numerous small segments of living. Thus, one school included special courses in shop mathematics, sewing mathematics, cooking mathematics, and so on, including French mathematics.

Most schools, however, were relatively conservative in including general or social mathematics in the curriculum to meet the needs of pupils who did not desire the usual sequential program. True, the early efforts presented countless problems. Teachers, trained to teach higher mathematics, often rebelled at teaching a course lower on the academic ladder, and tended to ridicule the course content. Pupils were quick to sense that those of less ability were steered into the new courses. Although it was designed for them, they resented the implication and did not include it among their electives. This condition presists in many areas today.

The principal, in his sincere efforts to provide a curriculum which can develop mathematical proficiency for all, has had to combat the inertia and prejudices that existed among teachers, pupils, and parents. Fortunately, there is positive evidence that general mathematics—a second-track mathematics program, as it were—is gaining considerable status. An increasing number of excellent textbooks are being published, teachers are aware of the need, and pupils are beginning to see the importance of at least adequate skill in the use of everyday mathematics. School systems that have worked conscientiously for several years to develop this other mathematics area report promising and positive results.

General mathematics will be as respectable as the administration and staff make it. If it is a dumping ground, it will be respected as such; if it is truly designed for the good of the pupils, it will win the confidence and respect of all.

DIAGNOSIS, REMEDIATION, AND PROGNOSIS

Throughout the entire high-school period, the principal should encourage the use of a scientific, objective approach in the selection of mathematics materials and election of courses. The administration is in a unique position to foster the use of diagnostic and prognostic techniques. Perhaps no single area of education lends itself so well to an in-service training program for teachers. But diagnosis and prognosis are of little value unless the program can contain remedial measures and offerings to satisfy the results of prognosis. Here again, the administration must be prepared to make the most of available resources to satisfy these needs.

IMPLICATION FOR GUIDANCE

Briefly, the principal should enable the guidance program of the school to utilize the mathematics profile of the pupil to its greatest advantage. Whether there is a well-staffed guidance "department," or whether there is no counselor other than the home-room or classroom teacher, there should be an adequate knowledge of the abilities of each pupil as well as the areas of mathematics open for each. Apt pupils should be counseled into one track of mathematics or the other only after consideration of all facets of the pupil and not only on the basis that "he can (or cannot) pass Algebra I." In any event, in this era, counselors should be selected who are familiar with the vital roles of mathematics and science in our present economy and in our international relations.

EXTRACURRICULAR ACTIVITIES

In order to stimulate interest and to broaden the scope of the curricular program, the administration can stimulate the organization of various clubs which involve the use of mathematics. Simple mathematics clubs, consumer

clubs, school finance committees, and astronomy clubs (space clubs?) are examples of organizations often used. Field trips to industrial plants, observatories, laboratories—even an informal talk with the surveyor working near the school grounds—and numerous other resources are good sources of stimulation and encouragement for the pupil to enter the mathematics program.

THE LARGE AND SMALL HIGH SCHOOL

The large high school enjoys a decided advantage in that it usually has a sufficiently large staff and adequate facilities to present a well-rounded mathematics program, complete with electives and multi-track opportunities. The major problem of the principal is, "Who shall take which course?"

Smaller schools, however, usually have to resort to ingenious plans to provide even a minimum program. Picture the school with one mathematics teacher from grades 9 through 12. General mathematics, algebra I, plane geometry, solid geometry, and Algebra II can hardly be presented during a single year. Thus, presentation of courses during alternate years is frequently used, courses are consolidated, or, often, courses are not offered at all. In such situations laboratories, clubs, individual coaching, and practices of that nature tend to prepare an interested few for more advanced work.

FACILITIES AND EQUIPMENT

Here again, the principal must be alert to the needs of the mathematics program, or at least listen with a sympathetic ear to reasonable requests from the staff. Mathematics can be taught better with proper equipment and manipulative material. Charts, tools, blocks, geometric figures, volume measures, and so forth should be part of the mathematics laboratory—even though the laboratory is in reality an otherwise ordinary classroom. Audio-visual aids are becoming increasingly available in all fields, including mathematics. If there is not a system-wide director, then the principal is a key person in obtaining necessary equipment and encouraging its intelligent use.

LOOKING AHEAD

Viewing the next decade, the principal sees the current elementary-school bulge moving into the upper grades. The increased emphasis on technological training will likely foster greater interest in mathematics by more pupils. This means more classes, more teachers, and more classrooms.

The need for teachers trained in mathematics may become more acute than at present. The current publicity attending this need may bring an increase in numbers of adequately trained teachers, but the fact remains that at this time the number of students enrolled in mathematics programs in schools of

education is discouragingly small. Some schools have already resorted to scheduling available mathematics teachers for the maximum load of academic classes and have eliminated various supervisory assignments, such as study halls, from the schedules of such teachers.

On the positive side, administrators may anticipate increasing use of general mathematics programs as efforts are made to improve the teaching materials and as the courses gain more status with teachers and pupils alike. Combined efforts of educationists who seriously examine and improve these courses in the light of pupil needs are serving to raise the general level of instruction in this area.

In addition, the traditional sequence is undergoing interesting changes, again to meet pupil needs in high schools, colleges, and universities. Textbooks and teaching techniques are tending to relate much material, formerly completely abstract, to everyday experiences of pupils. The principal may now include higher mathematics in the curriculum with confidence that much of the program has utilitarian value for pupils with reasonably good ability.

Finally, there is a trend toward bringing introductory courses in analytic geometry and the calculus into the high school. Experiments are being conducted on a very modest scale in combining certain of the traditional courses, retaining bare essentials and discarding seldom used processes and techniques. The mathematics program from the point of view of the high-school principal presents countless challenging problems, but they are problems which cannot be sidestepped if we are to prepare our young people for a life in their times.

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1. *Arithmetic in General Education.* The Final Report of the National Council Committee on Arithmetic. *Sixteenth Yearbook* of the National Council of Teachers of Mathematics, 1941
2. *Education for the Talented in Mathematics and Science.* Bulletin, 1952, No. 15, U. S. Department of Health, Education, and Welfare
3. *Guidance Pamphlet in Mathematics for High-School Students.* Final Report of the Commission on Postwar Plans of the National Council of Teachers of Mathematics 1953. Washington 6, D. C.: The Council
4. *The Place of Mathematics in Secondary Education.* Final Report of the Joint Commission of The Mathematical Association of America and The National Council of Teachers of Mathematics. *Fifteenth Yearbook* of The National Council of Teachers of Mathematics, 1940
5. Van Engen, H., "Arithmetic in the Junior-Senior High School," Chap. vi. *Fiftieth Yearbook* of the National Society for the Study of Education, Part II, *The Teaching of Arithmetic,* pp. 103-119, 1952

B. GUIDEPOSTS IN CURRICULUM PLANNING IN MATHEMATICS

VERYL SCHULT

IN A rather large city, the following conversation was overheard between two parents who were very interested in their public schools:

FIRST LADY: Have you seen the new stadium? It's wonderful.
SECOND LADY: Yes, isn't it! Now I hear they're building a new curriculum.
FIRST LADY: A new curriculum? And what's that?
SECOND LADY: From what I hear, it's a lot like a merry-go-round.

Curriculum building can indeed be a merry-go-round unless the work has direction and is very carefully planned. This article will discuss some guideposts that have been helpful in planning curriculums in mathematics.

I. *Provision is needed for all of the mathematics teachers to think together and discuss vital questions*—For example: (a) What kind of mathematics program would be in harmony with the philosophy of this school? (b) What are the fundamental purposes of teaching mathematics? (c) Just what place should mathematics have in the secondary-school curriculum? (d) How can mathematics help serve the "imperative needs of youth"? [1]

Group thinking on these questions will help mathematics teachers to re-evaluate their goals, and see whether the subject matter taught is taught because of tradition or because it is the most valuable thing for pupils. Such discussions will lead to interest in and study of the nature of the school population, what students' future plans are, and whether their interests and needs are being served by the present curriculum.

II. *A survey of the resources for mathematics curriculum work will reveal much that is helpful*—For instance, reports of national committees summarize the trends in the national picture. Two particularly helpful reports are *The Place of Mathematics in Secondary Education*,[2] Fifteenth Yearbook of the National Council of Teachers of Mathematics, and the Report of the Committee on Post-war Plans [3] of the National Council of Teachers of Mathematics. Courses of study from other school systems are also helpful in that they reveal what others are doing, and are usually the result of much investigation and study. Results of any testing programs in the school system will reveal the achievements of the pupils and show some of the places where

[1] "The Ten Imperative Needs of Youth," from *Planning for American Youth*, a publication of the National Association of Secondary-School Principals. 1951. p. 9

[2] National Council of Teachers of Mathematics, *The Place of Mathematics in Secondary Education*. Fifteenth yearbook. 1940

[3] Commission on Post-War Plans of the National Council of Teachers of Mathematics, Second Report. *Mathematics Teacher* Magazine, May, 1945.

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the curriculum in mathematics is already strong or where it needs strengthening. Experiments with new courses or new units in old courses that have been tried or that can be set up in connection with curriculum work can help build the foundation in curriculum planning.

III. *Statistics from the national situation as well as from the local school system give a valuable background for building in mathematics*—A very helpful survey is one made by Kenneth E. Brown, Specialist in Mathematics at the U. S. Office of Education, which is entitled, "*Mathematics in Public High Schools.*"[4] This very recent bulletin summarizes many of the facts about the mathematics curriculums in the United States. A few of these facts are as follows: General mathematics, a correlation of several areas of mathematics into a single subject, is becoming accepted as a subject for seventh and eighth grades. In the ninth grade, approximately 40% of the pupils take general mathematics, yet half of the schools require algebra for graduation. (General mathematics is sometimes defined as a correlation of algebra, geometry, and trigonometry, which is only for the better-than-average pupils. However, an examination of the textbooks used in the courses in general mathematics shows that, in most cases, the content material is not designed to challenge the superior pupil.) Dr. Brown found that 92% of the schools require at least one year of mathematics in the last four years of the secondary school. Only 8% of the schools require geometry for graduation. Other offerings besides the traditional mathematics subjects include such courses as advanced general mathematics, consumer mathematics, and mathematics review. A study of the statistics in the local system, in the light of those from the national view, gives guidance for meeting the needs of the high-school population.

IV. *Co-operation is needed with many groups as well as individuals in order that mathematics may best fill its place in the curriculum.* For instance, co-operation is needed with other subject fields in order to find out how mathematics can fulfill its particular responsibilities. Co-operative work with teachers of science, art, home economics, shop, business education, economics, consumer education, *etc.* will unfold many ways in which the various curriculums can be mutually helpful. (Co-operation backfired in one case where a mathematics teacher was trying to teach a class how to find what per cent 40 is of 20. Every pupil correctly wrote 40/20 and proceeded to find the per cent, except one boy who wrote 20/40. When questioned by the teacher as to the reason for doing it that way, he said that his art teacher had taught the class that small things always go on top!) Administrators, parents, laymen in the community, pupils—all have unique contributions to make to a truly effective curriculum plan in mathematics.

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[4] Kenneth E. Brown, *Mathematics in Public High Schools.* Bulletin 1953, No. 5 of the U. S. Office of Education, Available from the Supt. of Documents, Washington 25, D. C. 20c.

V. *A comprehensive answer must be worked out to the question as stated in the criteria for evaluating the mathematics program in secondary schools*[5] *"How adequate is the offering for all pupils?"*—A professor was once asked how many students he had in his class. After thinking a few moments, he said, "Oh, about one out of every five." Mathematics is needed by every citizen whether he is that one gifted pupil out of five or not. However, many educators feel that GQ (gumption quotient) is more important than the IQ. Nevertheless, some kind of mathematics is needed for all, and needs seem to be increasing as our lives become more quantitative and as jobs become more technical and specialized. A number of state curriculums now regard the mathematics of general education as the basic course in high schools, with the traditional college preparatory mathematics considered as the specialized course. In 1952-53, thirty-two per cent of the pupils enrolled in high-school mathematics courses were in mathematics of the general education type, such as consumer mathematics, general mathematics, or high-school arithmetic. Most schools now have two tracks and many have three tracks of mathematics to meet the varying needs and interests of pupils. Ordinarily, a teacher prefers to teach superior pupils; so it is a *sine qua non* that teachers need to be convinced of their responsibility to *every* high-school pupil whether superior or dull. Then a successful multiple track program can be carried out. Fortunately, the mathematics of general education has been outlined, after a thorough study of activities of high-school graduates and of the mathematical needs of the ordinary occupations. These "essentials of functional competence" have been stated as a set of questions to high-school pupils in the final report of the Post-war Planning Commission[6] of the National Council of Teachers of Mathematics. In curriculum planning in mathematics, the committee needs to take into consideration this list of so-called essentials, and decide whether they are "essential" in the particular school system; and if so, how to have all pupils achieve competence in them. The list is as follows:

1. *Computation.* Can you add, subtract, multiply, and divide effectively with whole numbers, common fractions, and decimals?

2. *Per cents.* Can you use per cents understandingly and accurately?

3. *Ratio.* Do you have a clear understanding of ratio?

4. *Estimating.* Before you perform a computation, do you estimate the result for the purpose of checking your answer?

5. *Rounding numbers.* Do you know the meaning of significant figures? Can you round numbers properly?

6. *Tables.* Can you find correct values in tables; *e.g.*, interest and income tax?

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[5] *Evaluative Criteria*, 1950, Co-operative Study of Secondary-School Standards. American Council on Education, 1785 Massachusetts Ave., Washington 6, D. C.

[6] Commission on Post-war Plans . . . , *op. cit.*

7. *Graphs.* Can you read ordinary graphs: bar, line and circle graphs? the graph of a formula?

8. *Statistics.* Do you know the main guides that one should follow in collecting and interpreting data; can you use averages (mean, median, mode); can you draw and interpret a graph?

9. *The nature of a measurement.* Do you know the meaning of a measurement, of a standard unit or the largest permissible error, of tolerance, and of the statement that "a measurement is an approximation"?

10. *Use of measuring devices.* Can you use certain measuring devices, such as an ordinary ruler, other rulers (graduated to thirty-seconds, to tenths of an inch, and to millimeters), protractor, graph paper, tape, caliper micrometer, and thermometer?

11. *Square root.* Can you find the square root of a number by table or by division?

12. *Angles.* Can you estimate, read, and construct an angle?

13. *Geometric concepts.* Do you have an understanding of point, line, angle, parallel lines, perpendicular lines, triangle (right, scalene, isosceles, and equilateral), parallelogram (including square and rectangle), trapezoid, circle, regular polygon, prism, cylinder, cone, and sphere?

14. *The 3-4-5 relation.* Can you use the Pythagorean relationship in a right triangle?

15. *Construction.* Can you with ruler and compasses construct a circle, a square, and a rectangle; transfer a line segment and an angle; bisect a line segment and an angle; copy a triangle; divide a line segment into more than two equal parts; draw a tangent to a circle; and draw a geometric figure to scale?

16. *Drawings.* Can you read and interpret, reasonably well, maps, floor plans, mechanical drawings, and blueprints? Can you find the distance between two points on a map.

17. *Vectors.* Do you understand the meaning of vector, and can you find the resultant of two forces?

18. *Metric system.* Do you know how to use the most important metric units (meter, centimeter, millimeter, kilometer, gram, kilogram)?

19. *Conversion.* In measuring length, area, volume, weight, time, temperature, angle, and speed, can you shift from one commonly used standard unit to another widely used standard unit; *e.g.*, do you know the relation between yard and foot, inch and centimeter, *etc.*?

20. *Algebraic symbolism.* Can you use letters to represent numbers; *i.e.*, do you understand the symbolism of algebra—do you know the meaning of exponent and coefficient?

21. *Formulas.* Do you know the meaning of a formula—can you, for example, write an arithmetic rule as a formula, and can you substitute given values in order to find the value for a required unknown?

22. *Signed numbers.* Do you understand signed numbers and can you use them.

23. *Using the axioms.* Do you understand what you are doing when you use the axioms to change the form of a formula or when you find the value of an unknown in a simple equation?

24. *Practical formulas.* Do you know from memory certain widely used formulas relating to areas, volumes, and interest; and to distance, rate, and time?

25. *Similar triangles and proportion.* Do you understand the meaning of similar triangles, and do you know how to use the fact that in similar triangles the ratios of corresponding sides are equal? Can you manage a proportion?

26. *Trigonometry.* Do you know the meaning of tangent, sine, cosine? Can you develop their meanings by means of scale drawings?

27. *First steps in business arithmetic.* Are you mathematically conditioned for satisfactory adjustment to a first job in business; *e.g.*, have you a start in understanding the keeping of a simple account, making change, and the arithmetic that illustrates the most common problems of communications and everyday affairs?

28. *Stretching the dollar.* Do you have a basis for dealing intelligently with the main problems of the consumer; *e.g.*, the cost of borrowing money, insurance to secure adequate protection against the numerous hazards of life, the wise management of money, and buying with a given income so as to get good values as regards both quantity and quality?

29. *Proceeding from hypothesis to conclusion.* Can you analyze a statement in a newspaper and determine what is assumed, and whether the suggested conclusions really follow from the given facts or assumptions?

VI. *Curriculum planning is a continuous process*—New conditions bring new needs; and a curriculum is not a final pronouncement, but the best plan for meeting the mathematical needs of students at the time.

WHAT THE PRINCIPAL CAN DO

1. He can take the leadership in setting up curriculum committees and in helping members of these committees to get a broad view of the total curriculum picture, within which the work would follow in separate subject matter fields.

2. He can arrange for co-operation between subject fields.

3. He can provide committees with time to work.

4. He can provide money to buy materials, such as reports of national committees and publications like those mentioned earlier in this article.

5. He can co-operate in curriculum experiments involving new courses which teachers think are needed.

6. He can co-operate in a testing program which will help furnish important data for the mathematics committee.

7. He can arrange a two- or three-track program in mathematics within the high-school program so that varied interests and needs of pupils may be provided for. In such a varied program, all pupils, whether gifted or slow, will be able to reach their full potentialities.

8. He can help in the present crisis in which there is a desperate shortage of scientific personnel by using every means to guide gifted students into scientific careers. The bulletin, *Education for the Talented in Mathematics*

and Science,[7] gives many suggestions. The improvement of our standard of living and national defense depends on an increased supply of technical personnel. A knowledge of mathematics is necessary to success in most technical work. If the national supply of engineers, scientists, and technicians is to be increased, it will be necessary for more boys and girls in high school to study mathematics. In 1933-34, fifty-nine per cent of the pupils in high schools were enrolled in mathematics; in 1952-53, only fifty-one per cent were so enrolled. The shortage of engineers at the present time is critical. If the principal takes the leadership in providing adequate mathematics courses for the gifted pupils, a great service will be performed for the pupils and for our country which sorely needs them.

9. He can select sympathetic teachers to teach classes that are slow and need help and encouragement.

10. He can co-operate with the mathematics committee in allotting a fair share of the school budget for the mathematics supplies recommended by the curriculum committee and thus help to make mathematics classrooms real learning laboratories. One of the criteria for evaluating secondary schools [8] is: "To what degree are laboratory techniques used in classroom activities?" Laboratory techniques require materials and supplies, such as flannel boards, models, abacuses, cardboard, scissors, rulers, protractors, compasses, micrometers, slide rules, meter sticks, graph charts, *etc.* It is sad that, although everyone agrees that mathematics is a science, yet it is so seldom taught in a laboratory setting. There are also many good mathematical films and filmstrips which help to make mathematics interesting as well as more clearly understood, and which can be evaluated and brought to the attention of the schools by the mathematics curriculum committee.

11. He can provide good guidance facilities. He can secure copies of the *Guidance Pamphlet for High-School Students* [9] for each mathematics teacher, for each counselor, and a set of thirty or forty for the pupils in a classroom. This publication of the National Council of Teachers of Mathematics is very valuable in that it analyzes the mathematics needed for most jobs and professions and is written in high-school language so that pupils enjoy reading it. The principal can also help to get good guidance personnel, part of whose job it is to counsel pupils and guide each one into the mathematics course that is best for him. And doesn't "educate" mean to "lead forth"? Each pupil being in his right place should then be led to develop his mathematical talents to the fullest.

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[7] *Education for the Talented in Mathematics and Science*. Bulletin 1952, No. 15. U. S. Office of Education. Available from the Supt. of Documents, Government Printing Office, Washington 25, D. C. 15c.

[8] Evaluative Criteria, *op. cit.*

[9] *Guidance Pamphlet in Mathematics for High-School Students*, Final Report of the Commission on Post-War Plans of the National Council of Teachers of Mathematics. 1201 16th St. N. W., Washington 6, D. C., 1953.

C. STATUS OF MATHEMATICS EDUCATION IN PUBLIC SECONDARY SCHOOLS

KENNETH E. BROWN

APPROXIMATELY half of the pupils in grades 9 to 12 in the public secondary schools are enrolled in mathematics. The percentage of pupils taking college preparatory mathematics has steadily declined over the years (see Table I). In some courses in mathematics the number of pupils enrolled has increased, but in most courses it has not kept pace with the increased secondary-school enrollment.

The percentage of pupils enrolled in mathematics decreases from grade to grade. The enrollments in geometry, normally a tenth-grade subject, are equal

Table I. Number and percentage of pupils in the Last Four Years of Public Secondary-Day Schools Who Are Enrolled in Certain Courses in Mathematics, 1889-90 to 1952-53.

	Algebra		*General Mathematics*		*Geometry*		*Trigonometry*	
Year	*Number*	*Per cent*	*Number*	*Per cent*	*Number*	*Per cent*	*Number*	*Per cent*
1890 [a]	92,150	45.4			43,294	21.3		
1900	292,287	56.3			142,235	27.4	9,915	1.9
1910	420,207	56.9			228,170	30.9	13,812	1.9
1915	569,215	48.8			309,383	26.5	17,220	1.5
1922	865,515	40.2	266,918	12.4	488,825	22.7	32,930	1.5
1928	1,020,323	35.2	228,231	7.9	573,668	19.8	36,855	1.3
1934	1,367,210	30.4	333,348	7.4	767,171	17.1	59,858	1.3
1949	1,448,966	26.8	704,742	13.1	693,280	12.8	108,551	2.0
1953 [b]	1,475,900	24.6	901,300	15.0	659,300	11.6	104,000	1.7

[a] *Biennial Survey of Education in the United States, 1948-50.* Chapter. 5. (Federal Security Agency, Office of Education). United States Government Printing Office, Washington, D. C., 1951. p. 107.
[b] Estimate based on *Mathematics in Public High Schools,* Bulletin 1953, No. 5. U. S. Department of Health, Education, and Welfare, Office of Education, Washington 25, D. C.

to approximately one third of the number of pupils in the tenth grade. The number of pupils in intermediate algebra is equal to approximately 23 per cent of the pupils in the eleventh grade, and the number of pupils in twelfth-grade mathematics is one tenth of the pupils enrolled in that grade.

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Table II. Enrollments in Selected Courses in Mathematics in the Public Secondary Schools in the United States (1952-53).[a]

Subject	*Enrollment*
Arithmetic (7th grade)	731,200
General Mathematics (7th grade)	195,700
Arithmetic (8th grade)	823,500
General Mathematics (8th grade)	204,100
Elementary Algebra	1,135,800
General Mathematics (9th grade)	749,600
Plane Geometry	559,000
Intermediate Algebra	330,000
Solid Geometry	50,000
Trigonometry	50,000
High-School Arithmetic	128,900
College Algebra	16,800
Advanced General Mathematics	34,600
Mathematics Review	41,800
Consumer Mathematics	36,500

[a] Based on *Mathematics in Public High Schools,* Bulletin 1953, No. 5. U. S. Department of Health, Education, and Welfare, Office of Education, Washington 25, D. C.

ENROLLMENTS IN ALGEBRA AND GENERAL MATHEMATICS

Although the number of pupils enrolled in algebra has increased, the percentage of pupils enrolled actually has decreased. For example, in 1953 there were 27,000 more pupils taking algebra than in 1949, but the percentage has decreased 2.2. The data in Table I include enrollments in all courses in algebra. In elementary algebra alone there were 1,135,800 pupils in 1952-53, which was approximately 60 per cent of the number of pupils in the ninth grade (see Table II).

The number of pupils enrolled in general mathematics has increased since 1928 (see Table I), and now more than nine hundred thousand pupils are taking the subject. No doubt general mathematics attracts many pupils that otherwise would enroll in elementary algebra; however, the percentages of the combined enrollments have decreased over the years. Thirty years ago it was 52.6 per cent of the number of pupils in the last 4 years of high school and now it is 39.6 per cent (see Table I).

ENROLLMENTS IN GEOMETRY

More than half a million children in the secondary schools in the United States are enrolled in geometry. This number is approximately 34 per cent of the number of pupils in the tenth grade. The percentage of pupils taking

geometry does not vary with the type or size of school, but it does vary markedly between geographic regions. A recent survey found that the enrollment in one region was only 23 per cent of the tenth grade, while in another region it was 42 per cent. In studies[1] on reasons for teaching geometry, the ones most frequently mentioned by teachers are "to teach the student to think logically" and "to understand the meaning of deductive proof." If these objectives are being realized, one might wonder why less than one fourth of the pupils need these experiences in one region and nearly half the pupils need them in another region.

The percentage of pupils in the secondary schools enrolled in geometry has declined from 30.9 per cent in 1910 to only 11.6 per cent in 1953. Table I shows a decline between 1934 and 1953 in numbers of pupils as well as the percentages of pupils. Since geometry is usually prerequisite to college studies, especially in the scientific and technical fields, we might expect this decrease in enrollments to be reflected in the number graduating from college. Such is the case which is shown in Table III.

Pupils trained in mathematics—a language of modern civilization—are needed to increase our standard of living in times of peace and safeguard our nation in times of war. If our supply of mathematically trained personnel is to meet the nation's demands, more able pupils must receive training in mathematics.

GRADE IN WHICH SUBJECT IS TAUGHT

General mathematics may be offered in any of the grades from 7 to 12 in the public secondary schools or on the college level. The content of the course in general mathematics is a correlation of arithmetic, informal geometry, and the elementary concepts of algebra. In many cases the fundamental processes of arithmetic with their elementary social applications assume the major role. The length may be from a one-semester course to a sequential course of several years.

In the seventh and eighth grades, when these grades are included in the secondary school, one fifth of the pupils are enrolled in general mathematics. However, the largest enrollment is found on the ninth-grade level. Of the pupils enrolled in general mathematics in the last four years of high school, 81 per cent were in the ninth grade, 12 per cent in the tenth grade, 4 per cent in the eleventh grade, and 3 per cent in the twelfth grade.

Elementary algebra is normally a ninth-grade subject. However, in some geographic regions a third of those enrolled are from the tenth grade.

Geometry confines its enrollment primarily to the tenth and eleventh grades. In fact, 64 per cent of the pupils enrolled in geometry are in the tenth grade.

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[1] Brown, Kenneth E., "Why Teach Geometry?" *The Mathematics Teacher*, 43:103, March 1950, and Shibli, J., *Recent Developments in the Teaching of Geometry*, State College, Pennsylvania. J. Shibli, Publisher, 1932.

However, it should be pointed out that the grade level differs from one geographic region to another. For example, in one region the enrollment in geometry—normally a tenth-grade subject—is composed of 50 per cent eleventh-grade pupils. All courses in mathematics in the last four years of high school had pupils from at least three grade levels enrolled in them.

HOLDING POWER OF MATHEMATICS

If our nation is to continue its scientific expansion, many young people must receive instruction in mathematics. For instruction to be most effective, the pupil must experience success and understand the importance of his tasks. A recent study[8] of a randomly selected sample of schools showed that between the first and the second semesters of the school year 1952-53, the enrollment in algebra decreased 14 per cent for the boys and 9 per cent for the girls. In geometry the decrease was 18 per cent for boys and 11 per cent for girls. The decrease in enrollment in intermediate algebra (usually an elective subject) was 32 per cent for boys and 26 per cent for girls. The fact that the percentages of pupils enrolled in mathematics decrease from year to year and semester to semester is causing many leaders in mathematics education to restudy the mathematical offerings in relation to their holding power in the public secondary school.

MATHEMATICS REQUIRED FOR GRADUATION FROM HIGH SQHOOL

In 935 randomly selected high schools, 92 per cent of the schools required at least one year of mathematics of *all* pupils for graduation. Sixty-five per cent of the schools reported that either algebra or general mathematics would satisfy the requirement. For the college-preparatory pupil, nearly three fourths of the schools required at least two years of mathematics. More than half of the schools stated that algebra is one of the required mathematics subjects, and 40 per cent of the schools also included geometry. The requirement of plane geometry for college-preparatory pupils was nearly twice as frequent among large schools as small ones. It should be noted that many schools indicated that in addition to requirements for graduation attempts were made to guide pupils into mathematics courses according to their need.

TIME ALLOTTED TO MATHEMATICS

Mathematics classes usually meet five times each week for thirty-six weeks, for which one Carnegie unit of credit is given. In a recent survey, 96 per cent of the schools reported that the classes met five periods each week. In this procedure there seems to be general uniformity while the length of the class period varies among schools. Among a random sampling of schools, the

[8] Brown, Kenneth E., *Mathematics in Public High Schools*, Bulletin 1953, No. 5, U. S. Department of Health, Education, and Welfare, Office of Education, Washington 25, D. C.

class period ranged from 30 to 70 minutes. On the one hand 20 per cent of the schools had class periods of 60 or more minutes, while on the other hand 14 per cent had class periods of fewer than 45 minutes. Between these extremes were 25 per cent of the schools with class periods of 45-49 minutes and 40 per cent with classes of 50-59 minutes. Many schools reported that some of the time in the longer class periods was used for supervised study.

The greatest variation in length of class period was between schools in different geographic regions. In one region 43 per cent of the schools had class periods of an hour or more, while in another region 53 per cent of the schools had classes of 40-44 minutes in length. These data indicate that the amount of time a pupil receives instruction in mathematics depends largely upon the geographic location of the high school which he attends.

MATHEMATICS TEACHERS

Recent surveys have shown that more men than women are employed as mathematics teachers in the public secondary schools. In a selected group of 635 high schools with enrollments above 300, fifty-two per cent of the persons teaching one or more classes in mathematics were men. It was only in the junior high school that the number of women teaching mathematics exceeded the number of men.

In a randomly selected sample of public secondary schools, there were 2,667 persons who were teaching one or more classes in mathematics. Of these teachers 66 per cent were men. On the basis of this sample, it is estimated that in 1953 there were 29,000 persons devoting full time to teaching mathematics and 36,000 persons devoting part time to the subject. Nearly half of the schools had two or more persons who devoted only part time to the subject. This tendency to assign teachers to more than one subject area was greater in the combined junior-senior high school than in the other types of schools.

There was a variation among geographic regions as to the number of part-time and full-time teachers. In one region 85 per cent of the schools had two or more teachers devoting part time to the teaching of mathematics, while in other regions it was only 37 per cent. These data might raise the question of whether it is better to assign the teaching of mathematics to several members of the high-school staff or to a few members of the staff who have specialized in this area.

The number of persons graduated from college who are prepared to teach mathematics has decreased rapidly since 1950 (see Table III). The large bulge in elementary-school enrollments has now reached the seventh grade. As this large enrollment moves into the secondary school in the face of an inadequate supply of teachers, there may be an even greater tendency for mathematics to be assigned to various persons with minimum qualifications.

Table III. Number of Graduates and Graduates Prepared To Teach.*

Year	Total Bachelor's Degree Graduates	Per Cent Change From 1950	Total Graduates Prepared to Teach in H. S.	Per Cent Change From 1950	Total Graduates Prepared To Teach Mathematics	Per Cent Change From 1950
1950	433,734		86,890		4,618	
1951	384,353	−11.4	73,015	−16.0	4,118	−10.8
1952	331,924	−23.5	61,510	−29.2	3,142	−32.0
1953	300,000	−30.8	55,468	−36.2	2,710	−41.3

* Phi Delta Kappan, Homewood, Illinois. Vol. XXXV, No. 2. p. 403.

Sizes of Classes

In a survey [8] of selected high schools with enrollments over 300, more than half of 11,527 classes had more than thirty pupils per class. The survey may not be representative of all high schools since it contained an unproportionate number of large junior high schools. A study of a randomly selected group of high schools showed that 37 per cent of the classes were above 31 in enrollment. In fact, three per cent contained more than 41 pupils. The larger classes were in the larger schools and more frequently in the junior high school than in the other types. In fact, 60 per cent of the mathematics classes of the junior high school contained more than 30 pupils compared with 30 per cent for the other types of schools. Also the mathematics classes for the seventh and eighth grades were larger than those for the ninth grade. The classes in general mathematics in the seventh and eighth grades were usually larger than those in arithmetic. For example, in seventh-grade arithmetic 55 per cent of the classes had enrollments greater than 30 pupils, while in seventh-grade general mathematics classes, 58 per cent of the classes had enrollments above 30. In the eighth grade the enrollments above 30 for the arithmetic and general mathematics were 49 per cent and 54 per cent, respectively.

FIELD TRIPS

Planned field trips have been suggested by leaders in mathematics education as a means of enriching the instruction. The field trip usually consists of an educational activity that requires the pupils to leave the classroom. In this way the teachers can point out the relationships of the mathematics of the classroom to the mathematics of the community. A study of a sample of randomly selected high schools showed that not more than seven per cent of the schools used field trips as a regular part of instruction in any course in mathematics. The junior-senior high schools used field trips one third as

[8] This survey is described in the pamphlet, *Teaching the Rapid and Slow Learner in High School*, which will be available about September 1, 1954, from the U. S. Office of Education, Washington 25, D. C.

frequently as the junior high schools. In a recent survey of selected schools with enrollments over 300, the heads of the departments of mathematics indicated that two thirds of their most effective teachers with the rapid learner and slow learner never used field trips.

Although used in only a small percentage of the schools, properly planned field trips as a means of motivating and enriching the teaching of mathematics may be very desirable. The pupil's direct experience in observing the uses of mathematics in his community should make the mathematics of the classroom more interesting and meaningful.

DEVELOPMENT OF CURRICULUM MATERIALS IN MATHEMATICS

One indicator of the educational status of a subject is the current curriculum material in that subject. With this purpose in mind, an analysis [4] was made of 135 courses of study or teaching guides in mathematics, of which 107 were developed by local schools and 28 by state departments of education. Among the reasons given by those states which did not provide a course of study in mathematics were: local schools are required by law to develop their own course of study, the state departments of education assist local schools in developing a course of study, and the textbook is the course of study.

The data in this survey were compared with the data in a survey that was made in 1932. There was little difference in the style of binding, printing, or number of pages over the years. The guides were usually mimeographed and stapled. However, there were some marked changes in the content of the guides and the way the guides were prepared.

The more recent guides were usually prepared by groups of classroom teachers. In only a few cases were the guides prepared by specialists at a central office. In some cases the curriculum committee was selected by the local teachers; in other cases the curriculum committee was appointed by a central office. In either case usually many classroom teachers took part in developing the guide. The work of the curriculum committee usually extended over a year or more. For example, in some states the guide was the result of several summer workshops. In some local communities the mathematics teachers of a school system devoted many after-school hours for a year or more in preparing a guide for one course in mathematics such as general mathematics.

The general purpose for preparing the teaching guides in mathematics seems to be that of encouraging the educational growth of the teacher rather than prescribing content to be taught. In harmony with this principle, the development of the recent guides usually involved many teachers. One recent state bulletin on the teaching of mathematics was the contribution of more than 1,000 persons.

[4] For further details of this study, see the pamphlet, *Curriculum Material in Mathematics*, which will be available about September 1, 1954, from the U. S. Office of Education, Washington 25, D. C.

An analysis of the teaching guides in mathematics revealed that about one eighth of the space in the teaching guides was devoted to objectives. The objectives were usually given in an organized outline; however, an occasional junior high-school guide would present them in an informal discussion. The bare list of objectives that were common in 1932 were less frequent in 1952. A closer relationship between the broad aims of the subject and the general aims of education was more evident in the recent guides than in those of 1932.

There was great variation in the amount of space devoted to procedures. The state courses of study usually devoted more space to this item than the guides prepared by local schools. The method of presenting content and procedures in parallel columns which was so evident in 1932 seems to be replaced by an organized outline or an informal discussion. There were few illlustrative lessons in the recent teaching guides. General discussions of individual differences were occasionally included in the procedures but seldom were definite procedures given for either identifying or providing for the slow learner or rapid learner. The use of community resources was recommended in many guides, but specific recommendations or illustrations were lacking.

Approximately 35 per cent of the space in the junior high-school guides and 45 per cent of the senior high-school guides was given to content. The junior high-school guides more frequently than the senior high-school guides used the psychological approach in developing the content of the courses in mathematics. A greater percentage of the guides in 1952 than those in 1932 related the content directly to the specific objectives of the course in mathematics; in fact, almost three fourths of the recent guides attempted to relate the content to the detailed aims as stated in the teaching guide. More guides in 1952 than in 1932 had the material organized on a unit plan; however, the units were of subject matter usually directly related to a textbook.

In both surveys, few guides contained specific materials for remedial instruction, for the slow learner, or for the rapid learner. Only about half of the teaching guides contained material on individual differences. The few suggestions that were included usually emphasized supplementary activities, the purposes of which was the mastery of a specific skill. There was little evidence of objective studies in the selection of the content. In only a few instances were there suggestions for adapting or selecting content appropriate to a local community.

In the teaching guides in mathematics, there has been little change during the past twenty years in the amout of space devoted to evaluation. Suggestions for testing appreciation and reasoning were more frequently found in the recent guides. In 107 local teaching guides, two thirds of the junior high guides and one third of the senior high guides contained suggestions for testing skills and knowledges.

The concept of curriculum development as a continuous process is evidenced by the fact that two thirds of the junior high guides and one half of the senior high guides provide for revisions. This is a substantial percentage increase in this characteristic over the survey in 1932.

The survey of the teaching guides in 1952 indicates that curriculum development is being viewed as a continuous process, the responsibility for curriculum development is being shifted from a central authority to a local school system, and the evaluation is left to the individual school or teacher. The objectives are becoming more closely related to the overall objectives of the school, but the guides seldom point out the relation of the content to these objectives. The content and procedures place more emphasis on the newer courses in mathematics such as general mathematics or consumer mathematics. Suggestions for testing emphasize attitudes and meanings with less emphasis on knowledge and skills. Although there have been desirable advances made in the more recent teaching guides, few guides provide the teacher with many concrete specific suggestions for providing efficient mathematical instruction in the present overcrowded classrooms.

D. ARTICULATION OF SECONDARY MATHEMATICS AND COLLEGE MATHEMATICS

CARROLL V. NEWSOM

THE organization of American education is such that a discontinuity, to use mathematical parlance, exists in a student's career between high school and college. Every personnel officer in our colleges and universities can quote statistics and cite examples to demonstrate the seriousness of the situation; yet, interestingly enough, there have been few genuine efforts to close the gap between the two educational levels. It is true that guidance officers in the high schools have attempted to advise their students in such a manner that their high-school programs would seem to provide a foundation for college study; the colleges have given wide publicity to their entrance requirements; college remedial courses have been created; and there have been frequent exchanges of information between officials of the secondary schools and the institutions of higher learning. However, most of these efforts have accomplished little; the problem can only be resolved when subject matter specialists from both high school and college work together to develop continuity of program, at least for those students having college aptitudes, through the entire eight years of high school and college. This need is especially urgent in English, in mathematics, in the languages, and in the natural sciences. The accomplishment of such continuity in program is the true meaning of high-school-college articulation.

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Efforts at integration on the part of the two educational groups have not been too successful in the past; this has been due to many factors. Working around the conference table has been foredoomed to failure in most instances because of mutual mistrust, the result of mutual ignorance. Few high-school representatives have been able to understand the problems that exist in the colleges because of widespread dissatisfaction with the high-school product; they have found it especially difficult to comprehend the modern pressures that have given a highly competitive aspect to higher education and which require a "fast start" on the part of college students. College men, in turn, have possessed little knowledge of the problems that mass education has introduced into our high schools. College professors generally do not comprehend the facts stated so well by the *Report of the Harvard Committee* of 1945:

> In the seventy years between 1870 and 1940 . . . , while the general population was increasing three times over, the enrollment of high schools was being multiplied about ninety times and that of colleges about thirty times. And the end is not yet. Even now one young person in six fails to reach high school, and half of those who enter drop out before the end.

Moreover, in 1870, according to the *Report,* three fourths of those who attended high school went on to college; so the high-school function was clear: "it was quite simply to prepare for college." On the other hand, in 1940, only one fourth of our high-school students ultimately attended college, whereas three fourths took jobs at the conclusion of their high-school courses. The Harvard Committee commented upon this situation as follows:

> The ninetyfold increase in numbers observed above, a convulsion as powerful as an earthquake, was of course the controlling fact. But had this increase, vast as it has been meant simply a ninetyfold multiplication of the old plan and kind of schooling, it would have been comparatively minor. Far out-shadowing in importance this mere numerical increase is the gradual change which it has brought about in the whole character of the high school and in its function toward American society.

Of interest to us is the fundamental question, so well phrased in the *Report:*

> How can the interests of the three fourths who go on to active life be reconciled with the equally just interests of the one fourth who go on to further education?

During recent years definite steps have been taken by teachers of mathematics, upon both the high-school and college levels, to study problems of articulation. These studies, in most cases, have given attention to basic issues outlined above as a part of their concern with problems in the teaching of mathematics. Positive initiative has been taken by many local, regional, and national groups. Some of the most promising efforts are resulting from co-operative endeavors inaugurated jointly by the Mathematical Association of America, devoted essentially to collegiate mathematics, and by the National Council of Teachers of Mathematics, concerned primarily with mathematical instruction in the elementary and high schools. These two organizations jointly sponsored a conference at Madison, Wisconsin, in

September, 1952, that is having significant effects. Also, valuable impetus to studies of articulation has been provided by some of the projects subsidized by the Fund for the Advancement of Education; notably, the study sponsored by Andover, Exeter, Lawrenceville, Harvard, Yale, and Princeton and the study concerned with admission to college with advanced standing—known generally as "The Kenyon Plan."

There appears to be widespread acceptance of the idea that the great variation in ability found among high-school students makes virtually mandatory the construction of special courses in mathematics on the secondary level for those who should not be encouraged to go to college. Such courses usually go under the title, consumer mathematics. Admittedly, the introduction of such courses in addition to the usual pre-college sequence of studies creates special problems in staffing and in administration, but there is general agreement that the problem must be faced frankly by the high schools. The necessity for proper screening of students is given emphasis by the fact that the modern college curriculum has become sufficiently mathematical that a student entering college with only a background in consumer mathematics will find himself severely restricted in his college studies—even in the social sciences as well as in all the natural sciences. Perhaps some of the problems implied by the last statement are not as serious as a first reading would indicate, if, as many mathematicians believe, intelligent students not going to college will profit more from a study of the pre-college curriculum than from a study of consumer mathematics, *if the pre-college sequence is properly conceived.*

The traditional program in high-school mathematics—namely, elementary, intermediate, and advanced algebra, plane and solid geometry, and trigonometry—sometimes described as the pre-college curriculum, is now under severe criticism by progressive teachers in the high schools and especially in the colleges. There is growing belief that much of the dissatisfaction in our colleges is due not so much to faulty teaching in the high schools, as the phrase is usually conceived, but is the natural result of following a program of instruction designed a century or more ago when the philosophy of mental discipline was in vogue. It is quite probable that the very nature of the high-school curriculum is such that it provides an inadequate foundation for advanced study as well as an inappropriate basis for the common problems in mathematics faced by the adult citizens. At present the high-school program is based strongly upon the concept of drill, including extensive repetition of comparatively unimportant types of problems, and many major mathematical concepts of modern significance are omitted or receive scant attention. The report of the study sponsored by the three private secondary schools and the three universities, referred to above, makes such interesting observations as the following:

From the point of view of a crowded curriculum, we are convinced that each branch of mathematics operates under a law of rapidly diminishing returns. Once the basic notions are solidly understood—and this will require drill as well as thought—we think it is unwise to linger in loving elaboration of a set of ideas grown familiar. Of course it is possible to design problems of bewildering complexity in every subject from long division to trigonometry; it is also a waste of time. . . . The impact of these notions upon the present mathematical curriculum is heavy, for large parts of it turn out to be relatively unhelpful elaborations of principles which are better taught in other ways. The greatest single offender in this sense is solid geometry. It is a beautiful subject, but in the strictly mathematical sense it is an elaboration of plane geometry, and elaboration is not the point of mathematics. . . . The example of solid geometry can be repeated, on a smaller scale, in the teaching of algebra, plane geometry, and trigonometry. . . . If we are correct in claiming that there is excess fat on the body mathematical, it is good, in itself, to trim the present curriculum . . . . But we are not urging a cut in the traditional mathematics course because we want less time for mathematics. What we are trying to do is at once to bring into visible relief the great ideas of traditional algebra and geometry, and at the same time to make room for two additional sets of notions, those related to calculus and to statistics.

High-school algebra, by tradition, involves extensive manipulation of algebraic entities; and the very jargon that is employed, consisting usually of such words as *cancel, transpose,* and *reduce* reveals the fact that the concepts that underlie the manipulation, and which must be understood, are hidden from most of the students. Too frequently, students are quite unaware of the fact that their exercises in elementary algebra are expected to give emphasis and meaning to the accepted operations upon numbers and to the handling of equalities. Unfortunately, the number concept receives comparatively little attention in our high-school courses, and yet it is basic to all human conduct and to advanced studies in science and mathematics. It also is to be noted that high-school students never have experience with the fact that algebra, in common with all mathematics, is a deductive science; thus the great attention given traditionally to euclidean geometry, simply because of its deductive approach, loses much of its validity. High-school studies in geometry undoubtedly would have more significance in the student's later experience if much of the usual material were eliminated and if attention could be given to such concepts as "vector" and "cartesian axis system"; in fact, the rudiments of analytic geometry could very well be taught on the secondary level. High-school trigonometry is being critized severely. In science and mathematics the trigonometric functions receive their important utilization in circumstances not remotely connected with the solution of triangles. Yet high-school students are asked to spend a whole term on many types of solutions of numerous categories of triangles, and the actual computations frequently require extensive numerical calculations to fantastic accuracy. There appears to be little doubt that much of the present content of the high-school program could be replaced by more meaningful material.

Interestingly enough, in order to remedy deficiencies in the mathematical background of their students, the colleges too frequently have fallen into the same fallacies that have characterized the high-school program. The freshman courses in college mathematics have duplicated a considerable amount of the work in high school, and too often the college courses have merely intensified many of the fallacious judgments in content and approach that have been discussed above. E. A. Cameron, writing in the *American Mathematical Monthly* for March, 1953, makes the following observations about the introductory courses in college mathematics:

> The type of courses which offers most promise of substantial contribution to a general education is not adequately described by merely listing the topics covered. The spirit in which the subject is treated is of the greatest importance. An understanding of the nature and significance of mathematics is sought through an emphasis on basic concepts, the logical processes used in developing the subject, and the relation of the discipline to other fields through a consideration of its origins and its applications. Techniques, of course, are necessary, but there is plenty of evidence that many students pass their freshman courses by memorizing techniques without obtaining the slightest insight into the true nature of mathematics. . . . Increasing dissatisfaction with the inadequate contributions of traditional courses to a general education is impelling some institutions to undertake serious investigation in this area. The number of good textbooks suitable for a course of this character is extremely small. This fact has undoubtedly discouraged some institutions from instituting such a course.

The solution of our problem in the teaching of mathematics requires that high-school teachers and college professors join hands in company with the best creative mathematicians and with those versed in mathematical application in order that the total high school-college curriculum in mathematics may be reviewed and reorganized with care. In fact, such joint effort upon a systematic basis is long overdue. Specific plans for co-operative studies, as indicated above, are now in action or in process of development. Educational administrators virtually have an obligation to further the trend, for the net result must inevitably be a more efficient and effective educational program.

E. THE IMPACT OF MODERN MATHEMATICS

SAUNDERS MACLANE

MY SUBJECT is vacuous; the lively modern development of mathematics has had no impact on the content or on the presentation of secondary-school mathematics. Algebra and geometry, as covered in schools, consist exclusively of ideas already well known two hundred years ago—many of them two thousand years ago. No matter how much better these particular ideas are taught to more and more pupils, their presentation leaves school mathematics in a state far more antiquarian than that of any other part of

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the curriculum. The pupils can conclude only that there is no such thing as a new mathematical idea.

No conclusion could be further from the truth. Modern mathematics is full of new ideas, of new uses of old concepts, and of solutions of old problems, as witness for example the spectacular solution by three Americans in 1953 of the famous "Fifth Problem" of Hilbert (1900). Except for physics, none of the standard academic subjects has today more intellectual life and drive than does mathematics. That the secondary schools have isolated from this life is no one's fault and everyone's negligence. The mathematicians have pursued the new ideas with single-minded devotion, while the teachers have concentrated on the reformulation and presentation of the old ideas, so that there has been no exchange of interests.

Without an exchange of ideas, the impact of modern mathematics on the schools and society will be delayed and the result disastrous. The growing applications of mathematics in technology and in science call for many more well-trained young engineers; this training requires good mathematics in the schools. The need for a new generation of teachers of mathematics and science in the secondary schools is even more desperate. The growth of research in industries and in government laboratories has called for more research mathematicians. Before 1940 practically all professional mathematicians were engaged in teaching and in academic research; now more than twenty per cent of these mathematicians have industrial or government positions. One field alone, the management of the new high-speed digital computing machines, will call for hundreds of new mathematicians.

In purely academic positions, there is also a grave shortage of new mathematical talent. Today the United States is one of the two or three leading countries in the development of pure mathematical research, but this position has been achieved only thanks to the presence here of many talented mathematicians from Europe. At four leading American institutions for pure mathematics, over forty per cent of the full professors are men with European backgrounds. For the future, it is then essential that we develop new American talent; in the secondary schools, this means that young Americans with possible talent should have an opportunity to learn what mathematics is today, and not what it was for the Greeks.

But what modern mathematical ideas are relevant for pupils in the secondary schools? Take algebra, which deals primarily with the properties of addittion and multiplication. A simple and pervasive idea of modern algebra is this: addition is not just the usual addition of numbers. Everyone knows how to add numbers; for that matter, everyone knows how to add hours. Six hours past eleven o'clock is five o'clock; three hours after ten o'clock is one o'clock, and these sums may be written as: $6 + 11 = 5$ and $3 + 10 = 1$. This is not an ordinary sum; it is rather the ordinary sum after 12 and its

multiples are discarded: $6 + 11 = 17$ and $17 - 12 = 5$. The resulting process is known as addition "modulo 12"; in case one joins the Navy, one learns its counterpart, addition "modulo 24." The same sort of addition can be carried out with any positive whole number (in place of 12 or 24) as the modulus, and the process of addition which results has all the formal algebraic properties of ordinary addition. For example, for any "numbers" a, b, and c, added modulo 12, we have the rules: $a + (b + c) = (a + b) + c$; $a + b = b + a$; and $a + 0 = a$.

The conclusion is that algebra is really the study of the *formal* properties of addition and multiplication, like those listed just above for addition. These formal properties lead to the notion of an abelian *group* as a collection of things (not necessarily numbers) which can be added, subject to these and other formal properties. This notion of a group is a pervasive one; it appears throughout mathematics, in geometry and in mechanics, and in many parts of physics. The representations of such groups is essential to quantum mechanics. The notion of a group provides an analysis of the esthetic idea of symmetry. Finally, the basic description and illustration of this notion could easily be made accessible to high-school students as one instance of a simple and exciting new mathematical concept.

Take proofs or demonstrations. These have always appeared in school geometry, sometimes in fear-provoking form, and they have traditionally disappeared in school algebra, which is viewed more as a sort of manipulation, combined with the deciphering of mysterious unknowns. The fact of the matter, as emphasized by the modern development of precise and rigorous mathematics, is that proof is the form in which all mathematics appears, be it geometry or algebra or calculus. Once algebra is properly recognized as the study of the formal properties of addition and multiplication, it becomes clear that algebra is concerned with the proof of new formal properties from given ones—and that these proofs are simpler and much more prespicuous than those of geometry.

Customarily, some of the proofs of algebra are buried in geometry, where they suffer from the limitations of the classical Greeks, who were prejudiced in favor of geometry and didn't have algebra. How many pupils still labor through cumbersome statements like this: "If equals are added to the same thing, the results are equal"—when they should be dealing with the simpler modern statement: "If $a = b$, then $a + c = b + c$." The trouble lies in part with recent textbooks for schools, which sometimes are so obsessed with the hope of using proofs and logical arguments in practical matters that they lose sight of the simple ways of using proofs where they really belong throughout mathematics.

Take arithmetic, or rather, let's take arithmetic without counting to ten on our fingers. This method of counting accounts for our use of the ten

digits 0, 1, 2, . . . 9, and for the fact that the symbol 13 means 10 plus 3, while 245 means: $245 = 2\ (10)^2 + 4\ (10) + 5$. Instead, let's use only two digits and count 1, 10, 11, 100, 101, instead of 1, 2, 3, 4, 5. Then, for example, 1011 will mean: $1011 = 2^3 + 2 + 1$, or eleven in the ordinary notation. This idea of a different base for numbers is by no means new; but it has new importance, because this method of counting is of necessity used in the powerful modern digital computing machines—for the reason that they count on electrical relays, which have only two fingers, "off" and "on." This idea has the advantage of simplicity and practical relevance —plus the striking feature that it promotes real understanding of what the ordinary symbols for numbers mean. It is a notion which should be introduced to every secondary-school pupil, whether in business arithmetic, algebra, or elsewhere.

Take geometry. The Greeks understood the geometry of our ordinary three-dimensional world, and reduced the geometry of this space to axioms and proofs. Today, pupils sometimes still labor elaborately through the proofs of this solid geometry in spite of the fact that most of these facts can now be better developed by means of analytic geometry (the subject that ought to be in the curriculum at this point). The important modern discovery is that space isn't just the three-dimensional Euclidean space of our immediate experience, but that spaces and geometries of the utmost variety and character are possible and useful. For instance, most surfaces have two sides, but there can be one-sided surfaces: an easy illustration can be found by taking a long strip of paper, turning one end over, and then pasting the ends together. This model is but one vivid illustration of the notions of a new part of geometry known as topology. Again, take the notion that space has three dimensions, as illustrated by the fact that it takes three numbers to tell where your are. Thus you may be on the 7th floor at 579 East 12th Street, and the three numbers are the distances east, north, and up from the center of the city. But to tell where you are and where you are heading takes six numbers—two more to specify your direction and still another for your speed. This means that "space" of positions and velocities has six dimensions; it gives but one illustration of the way in which the modern idea of the variety of possible geometries can be presented.

Take trigonometry. When taught, it still appears chiefly as a means of solving triangles, and these triangles are often solved laboriously with logarithms, even though actual practical use might often replace the logarithms by computing machines. The real idea behind logarithms is often lost, even though it can be stated very simply as a method of changing multiplication into addition, in symbols: $\log\ (ab) = \log a + \log b$. This single equation, and not the long computation, is what really matters in higher mathematics, for the self-same idea of turning multiplication into addition appears over and

over again in group theory and elsewhere, where it goes under the general name of a homomorphism (of a multiplicative group into an additive group).

The trigonometric functions are likewise put in for the wrong reasons. The function sin x is not important because of long tables of its values or because of fancy identities; it is important because it is a function which repeats itself periodically according to the equation $\sin (360° + x) = \sin x$. It is this behavior which makes the trigonometric functions important in the analysis of all sorts of waves and other periodic or recurring phenomena, from business cycles and the equations of heat flow to the most sophisticated parts of modern harmonic analysis.

Take calculus—or should we take it? In this country it is traditionally a subject for colleges, where it is often shrouded in the undeserved reputation of undue difficulty, while in Europe it traditionally belongs to the secondary schools. That, I submit, is where it really belongs, at least in its initial stages. The idea of a derivative is a basic one in calculus. The derivative can appear as a velocity; indeed, only in this language can one properly formulate this basic notion of physics. The derivative can be interpreted as a marginal utility, and here it gives the proper formulation to this basic notion of economics and social studies. Modern technical society would be impossible without the devices provided by the calculus; it is high time that secondary-schools pupils have some opportunity to see what this means.

Take the algebra of sets as an illustration of one of the still newer mathematical subjects of relevance to the schools. A set A is just an arbitrary collection, finite or infinite, of things. There are algebraic operations on sets A and B. The sum $A + B$ is defined as the set of those things which belong either to A or to B or to both; the product AB is the set consisting of those things which belong to both sets A and B. These operations are not quite like those of the ordinary algebra of numbers, because for sets we have both $A + A = A$ and $AA = A$, but there is nevertheless a consequential algebra of sets. The very simplicity and generality of the notions involved account for their wide applications—from logic and the design of electrical circuits to various social studies. Furthermore, this algebra of sets could readily be made accessible to pupils in the secondary schools.

To summarize, then, modern mathematics is marked by the construction of a wide variety of new concepts, by the abstract consideration of their properties and the concrete examination of their instances, and by the formal demonstration of facts about them. The examples above give but a few instances of some of these concepts which can make sense to pupils in the secondary schools. The mathematical subjects now taught there need drastic overhauling. It no longer suffices to continue to teach the old ideas; rather, one must start afresh to determine which ideas should be taught and in what perspective. In this way, school mathematics could become fully relevent to the modern world.

F. MATHEMATICS AND THE CORE CURRICULUM

HAROLD P. FAWCETT

WITHIN recent years many critical questions have been raised concerning the effectiveness with which the schools of America are meeting the needs of a growing and developing democracy. Significant social and economic changes have tended to focus attention on institutions and practices created to serve the demands of an earlier day. A greatly increased school population has emphasized the importance of general education, and new theories of learning have raised serious doubt about the value of educational procedures designed to serve an intellectual aristocracy. Many an influential voice has asked penetrating questions concerning the adequacy of a curriculum based on the fundamental assumption that "knowledge is power," and increasing attention has been given to the development of those characteristics of personality considered essential to responsible citizenship in a democratic society.

Against this background of confusion and uncertainty, earnest and thoughtful people, believing that the schools of America should be great laboratories of democracy, have proposed a fundamental curricular reorganization designed to yield this desirable result. They recognize the important fact that democratic outcomes can only be achieved by means that are also democratic. People tend to become what they do. Dictatorial methods will not yield democratic behavior. Critical thinking cannot be developed in an atmosphere which stifles critical thinking. Respect for the rights of others can be "learned" most effectively through methods that call for behavior consistent with that outcome, nor is knowledge alone a one-way road that leads to power.

THE CORE CURRICULUM DEFINED

As a possible means of improving this situation, "the core curriculum" is claiming the increasing attention of thoughtful men and women who are interested in developing an educational program appropriate to the needs of our democratic culture. What is the nature of the core curriculum? Approximately 300 years ago it meant the subject matter required of all students, and it is used in precisely the same sense by the twelve distinguished men who wrote *General Education in a Free Society*.[1] In early colonial days when every township of one hundred householders was required to establish a secondary school, it meant only Latin and Greek, while in the Harvard

[1] Harvard Committee. *General Education in a Free Society*. Cambridge, Massachusetts: Harvard University Press, 1945.

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report it means eight units of secondary work—"three in English, three in science and mathematics, and two in the social studies." [2]

During the three centuries that have elapsed since the days of the Latin grammar school, the core curriculum has steadily evolved from the subjects required of all to a unitary group of activities "planned by each pupil in his emerging experiences in co-operation with other pupils and under advice of members of the teaching staff." [3] In a thorough and comprehensive treatment of this important curricular development, Professor Alberty [4] defines the core "as that aspect of the total curriculum which is basic for all students and which consists of learning activities that are organized without reference to conventional subject lines." He then proceeds to list eleven characteristics of core teaching—two of which are found in all current practices. These two are:

1. The core consists of learning activities that are regarded as basic to the education of all students. Within this framework, however, provision is made for individual differences.

2. The learning activities cut across conventional subject matter lines. This may involve "putting two or more subjects together" or complete disregard of boundaries.

From these considerations it is evident that "the core" still refers to those "common learnings" required of all students, but the modern concept of what these common learnings are is vastly different from that of 1647. The emphasis today is on those learnings considered appropriate for effective participation in a democratic culture, and knowledge becomes important to the extent that it is functional in improving the quality and character of life.

RELATION OF MATHEMATICS TO THE CORE

One of the questions frequently asked concerning any core organization as earlier defined is whether or not mathematics is "in the core." The variety of answers given to this interesting question have been highly suggestive but satisfying to no one. Of course mathematics is "in the core"; for, if the core is regarded as "that aspect of the total curriculum which is basic for all students," it will, of necessity, include mathematics. Is there any school anywhere operating on the theory that the curricular experiences "basic for all students" should not include mathematics? Is anyone prepared to support the proposition that a man who is mathematically illiterate is appropriately educated for responsible citizenship in this atomic age? Any adequate study of "the major problems of living" calls for the use of mathematical concepts, principles, and processes; and to discuss the question as to whether or not mathematics is "in the core" or "out of the core" is comparable to discussing the question as to whether or not language as a means of communication is "in the core"

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[2] *Ibid.*, p. 100.

[3] Hopkins, L. Thomas. *Integration—Its Meaning and Application*. New York: D. Appleton Century Company, 1937, pp. 234-52.

[4] Alberty, Harold. *Reorganization of the High-School Curriculum*. New York: The Macmillan Company, 1947, pp. 154-55.

or "out of the core." Mathematics is not an inert body of knowledge to be moved "in" and "out" of a core at the whim of any given teacher or any group of teachers. It provides a language and a method which are essential to an intelligent study of any core problem. How, for example, can the students of Santa Barbara County, California, study the problem of "Spending Your Money Wisely" [5] without using the methods, ideas, and techniques of mathematics? Does not the problem of "Preventing Accidents" [6] call for the securing of data concerning the number of accidents, the construction and interpretation of tables and graphs, and the drawing of valid conclusions? Would any thoughtful teacher study the problem of "Providing Public Education" [7] and not consider such relevant data as the number of children to be served, the size of the plant needed, the cost of school buildings, salaries of teachers, taxes, and the like? There is no question as to whether or not mathematics is "in the core." The real question is the effectiveness with which mathematics can be learned through core procedures and that is a question which commands our careful consideration.

CORE PROCEDURES AND MATHEMATICAL INSIGHTS

One of the characteristics common to most all cores is a large block of time, usually from two to three hours, which provides flexibility in the plannings of activities suited to the needs of the situation. It is within this block of time that learning activities "basic for all students . . . are organized without reference to conventional subject lines." Should mathematics be "in the core" in the sense that it is to be taught within this block of time? Is mathematics best learned within such a framework? Fortunately we do not have to depend on theory and unsupported opinion as we seek to answer these important questions, for this problem has already been studied by interested people and their findings cannot be ignored.

One such study entitled "Opportunities for the Use of Arithmetic in an Activity Program" is reported by Paul Hanna.[8] Six teachers of grade 3 and six teachers of grade 6 were selected to assist in the study. In the seven schools represented by these twelve teachers, the children's experiences were not organized "with reference to conventional subject lines," but rather were organized and integrated around worth-while interests.[9] "Each teacher was asked to record on prepared blanks every situation faced by individuals or by her entire class, in which there was a need for quantitative thinking and manipulation," and the problems recorded were to be only "those problems

[5] Selected from problems suggested in the *Santa Barbara County Curriculum Guide for Teachers in Secondary Schools*. 1941.
[6] *Ibid.*
[7] *Ibid.*
[8] Hanna, Paul. *Opportunities for the Use of Arithmetic in an Activity Program*. Tenth Yearbook, National Council of Teachers of Mathematics. 1935. pp. 85-120.
[9] *Ibid.*, p. 90.

which arose in the pursuit of some child-selected activity." [10] These records were kept carefully over a period of four months, and in the six third-grade groups the total number of such "essential" quantitative problems was 234. Only fifty-six per cent of these, however, called for actual computation which means that, on the average, only five computational problems per room per month were included. The "child-selected activity" in the sixth-grade groups yielded a total of 205 quantitative problems in seventy-two per cent of which actual computation was needed. This means that, if the arithmetic program of these children were limited to the quantitative work essential to the study of the core problem, there would have been, on the average, approximately six computational problems per month for each of the sixth-grade rooms. In view of these findings, it is not surprising that included in the report are the following statements: [11]

1. Functional experiences of childhood are alone not adequate to develop arithmetic skills.

2. The teacher should regard these meaningful arithmetic experiences as readiness . . . and must provide sufficient periods of practice to assure mastery.

3. Some guide or criterion in addition to opportunities-found-in-activities is essential to the selection of arithmetic materials.

The report also emphasizes the fact that "there is a large element of chance operating in the selection of units of work"; and since the mathematics involved is determined by the type of unit selected, it seems fair to say that any such educational procedure leaves to chance the mathematics studied.

Another study related to this problem was made by Catherine Williams [12] whose concept of the "experience curriculum" is very significant. While it does not include the "cramping restrictions or expectations of pre-determined organized subject matter requirements," neither is it to be "limited to a concept of curriculum based entirely on direct firsthand contacts with reality. It is not to be confused with a more or less casual opportunistic dependence on incidental learning," and the pupils "are guided into a realization of the ways in which meaningful learnings can be broadened, extended, and applied." [13] Consistent with this philosophy Miss Williams skillfully uses the quantitative demands of a "core problem" to provide meaning and purpose for mathematics, and the learnings thus acquired are "broadened, extended, and applied." They are not limited to "those problems which arose in the pursuit of some child-selected activity" as was the case in the Hanna study, and in this "extension" and "broadening" of learnings beyond the actual "opportunities-found-in activities" it may be that Miss Williams is using the "guide or criterion," the finding of which was considered "essential" by the Hanna

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[10] *Ibid.*

[11] *Ibid.*, pp. 118-19.

[12] Williams, Catherine, *The Contribution of an Experienced Curriculum to Mathematical Learning in the Sixth Grade.* Unpublished doctoral dissertation, Ohio State University, 1947.

[13] *Ibid.*, p. 15.

Committee. Beyond the large block of time devoted to core activities, this committee also emphasized the desirability of providing "sufficient periods of practice to assure mastery." This general principle seems to be supported by Miss Williams for, in the weekly schedule of her students, three 45-minute periods and two 30-minute periods are devoted to "mathematical experiences." Through such planned and creative guidance, it is not surprising that the students participating in this problem consistently showed desirable growth in both reasoning and computational ability.

An interesting and significant study on the high-school level is reported by Wallace P. Mannheimer.[14] The core problem was "Health" and was designed to integrate functional learnings from English, general science, and elementary algebra. Formulas relating to temperature and the multiplication of bacteria were considered, while statistical methods were applied to health data. Mr. Mannheimer reports, however, that:

> . . . In our statistical studies we found most of the data formidably complex. To discern trends in such data is a problem to tax an expert statistician, let alone a class in Algebra 1. New concepts can best be learned in simple settings; but the core prevented our doing this. Eventually I was obliged to throw the health figures overboard and substitute very simple data. When I was ready to return to the more complex picture, my colleagues were ready to leave it . . . The core became a restriant rather than a stimulus to the motivation of algebra.[15]

He states that he made sincere efforts to carry out the "spirit of the core" and received the heartiest co-operation from his colleagues in the English and science departments. As a result of this experiment, however, he expresses the opinion that "the 'coring' of mathematics was fruitless" and recommends that "we enrich our teaching of mathematics by relating it, far beyond the boundaries of any core, to the physical, biological, and social phenomena about us." [16]

Another experimental study in which an earnest effort was made to integrate general mathematics with the core program is reported by Ruth Adler and Max Peters.[17] Core experiences were planned around three units of work: the first entitled "Orientation"; the second, "Understanding One's Self and One's Family"; and the third, "Getting Along with Others." Two additional units were included in this program, neither of which seems to have had any relation to the units of the core. One of these was on "Formulas," while the other was a "Mail-order unit," and each of them seems to have been more interesting and stimulating than were the three core units. It is, in fact, not without genuine significance that, among the "positive

[14] Mannheimer, Wallace P., "Mathematics in the Core Curriculum," *Highpoints,* Volume XXVI, No. 8, October, 1944, pp. 71-73.

[15] *Ibid.,* p. 72.

[16] *Ibid.,* p. 73.

[17] Adler, Ruth, and Peters, Max. "General Mathematics and the Core Curriculum," *The Mathematics Teacher,* Vol. XLVI, No. 3, March, 1953, pp. 171-177.

lessons to be learned from this experience," the authors include the following statement:

It is not necessary to relate all mathematical topics to the core. It should not be overlooked that, in addition to the other interests of adolescents around which the core is built, they have an interest in learning as such. In the units of formulas, wholly unrelated to the core, the classes derived genuine satisfaction and a sense of accomplishment from learning something new.[18]

Do the authors mean to suggest in this honest and significant statement that "an interest in learning as such" is *not* nourished through core procedures? It is not at all surprising that the students "derived genuine satisfaction and a sense of accomplishment" from their study of formulas, but it would be interesting to know why these desirable outcomes were not also associated with the mathematics related to the core.

These four experimental situations serve to define a number of important problems concerning the effectiveness with which mathematics can be taught inside the core curriculum. Among these are the following:

1. How is the interest in the core problem affected if the students are required to learn with insight and understanding the mathematics essential to its study?

2. Can the core program provide opportunity for the development of mathematical understandings and skills commensurate with modern living?

3. If core activities are to be "organized without reference to conventional subject lines," what is the effect on mathematical learnings?

One of the attractive features claimed for the core curriculum is the opportunity which it provides for pupils to participate in the selection of problems in which they have a real interest and about which they are genuinely concerned. The Hanna Committee, for example, refers to the "problems which arose in the pursuit of some child-selected activity," while Miss Williams reports that "active participation by the children in the selection of their unit of study was an integral part of the school's program of democratic living."[19] Interest is indeed a powerful factor in any educational program, and every thoughtful teacher recognizes the value of plans and procedures which claim the interest of his students. This same important factor operates in the learning of mathematics, and it might be well to consider what happens when the student's progress toward the solution of the core problem is deflected by the necessity for learning some mathematics along the way. Does his assumed interest in the core problem provide the needed motivation for a genuine understanding of the mathematics essential to its solution, or is he tempted to look for answers regardless of how they are secured? When he is faced, for example, with the necessity of multiplying $1\frac{1}{4}$ and $3\frac{3}{8}$ or of finding the circumference of a circle with a given diameter, is he willing to submerge the larger drive stimulated by his interests in the core problem and make the kind of detour into the land of quantity

[18] *Ibid.*, p. 177.
[19] Williams. *Op. cit.* p. 29.

and space which is essential if he is to have a real understanding of the processes by which these needed results are secured? Will he have the opportunity to use tangible materials and actually "see" with his hands and with his eyes what the product of two fractions really means before any effort is made to intellectualize the process? Will he be guided in an exploration of the relation between the circumference and diameter of a circle through which he finds an approximate value of *pi*? Will time be provided to acquaint him with the many significant episodes associated with the evolution of this very important ratio, or will his interest in the larger problem call so loudly for the needed answers that he will be encouraged to resort to meaningless manipulation to secure them? How can mathematical insights be developed, important concepts clarified, and general principles established in an atmosphere which places a heavy premium on the importance of answers?

Through such an emphasis, the student will tend to believe that mathematics is nothing more than an incidental tool, irritating in its necessity and a heavy burden on the memory. In fact, there is more than a little truth in the statement of Mr. Mannheimer that in any such attempts to "core" mathematics we may be stressing only "its most superficial connections with the rest of the curriculum"[20] and to take the time needed for the building of real mathematical insight is seriously to interfere with the larger drive.

MATHEMATICS IN THE CORE PROBLEM

The amount and kind of mathematics directly or even indirectly related to a core problem are variables with a wide range of values. The two most important factors which have direct influence on this situation are:

1. The nature of the problem selected for study.
2. The background of the teacher directing the study,

It is possible, for example, to develop an interesting and fruitful study of aviation without including any mathematics, and that is precisely what was done by a teacher who himself had no mathematical background. His attitude toward this important field of knowledge does not differ greatly from that of many teachers who are providing very worth-while experiences through the core program but who are quite unprepared to develop the meaning of even the most elementary mathematical concepts inherent in the study. On the other hand, the study by Miss Williams provides reliable evidence of what can be done by a teacher who recognizes the extent to which mathematical concepts permeate the fabric of modern culture. A less gifted teacher could have guided the students in a very satisfying study of "South America—Past and Present" with little, if any, emphasis on mathematics. Miss Williams, however, greatly enriched this unit through her own appreciation of the value of mathematical concepts and her skill in developing problem situations

[20] Mannheimer. *Op. cit.* p. 73.

associated with these concepts. Her planning included definite provision for mathematical learnings, and the value of the five periods each week dedicated to "mathematical experiences" should not be overlooked.

The activities of any core will inevitably reflect the interests and competencies of the teacher guiding the program; and there is no assurance that the core curriculum, as suggested by Professor Fehr,[21] will necessarily include "that mathematics which is needed by all members of a democracy for everyday intelligent evaluation of their lives." There are, in fact, large elements of chance operating in the selection and conduct of these core units; and since an "intelligent evaluation" of responsible citizenship in our modern democracy calls for mathematical literacy, will we be faithful to our obligations if we leave to chance the development of a mathematical program appropriate to general education?

ORGANIZATION OF LEARNING

The characteristic of the core which places even more serious limitations on its usefulness as an instrument for the effective teaching of mathematics is the demand that learning activities be organized "without reference to conventional subject lines." Mathematics is a system of ideas; and to make it seem nothing more than a group of discrete manipulative skills, unrelated and unorganized, is to limit its usefulness and to distort its meaning. In a penetrating discussion of "Recent Trends in Learning Theory," Professor McConnell states: [22]

> In the case of arithmetic, attempts to psychologize the subject appear to have damaged it both logically and psychologically. By decomposing it into a multitude of relatively unrelated connections or facts, psychologists have mutilated it mathematically; and, at the same time by emphasizing or encouraging discreteness and specificity rather than relatedness and generalization, they have distorted it psychologically. They have obscured the systematic character of the subject, and have created a doubtful conception of how children learn it.

How can the potential learnings in a given situation ever become available for wider use unless they are organized around some unifying principle and generalizations established? Mr. McConnell further states that "as learning proceeds, one should construct more inclusive and systematic organizations of ideas and processes governed by the fundamental structure of the number system." [23] Surely no one would support the idea that unorganized experience is educative. What does one really learn from activity alone? The most active core classroom provides no greater guarantee of desirable learning than does any other kind of a classroom. Learning that is worth anything

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[21] Fehr, Howard, "Socializing Mathematics Instruction," *The Mathematics Teacher*, Vol. XLI, No. 1, January, 1948, p. 7.

[22] McConnell, T. R., "Recent Trends in Learning Theory," Chapter 11, *Arithmetic in General Education*, 16th Yearbook, National Council of Teachers of Mathematics, New York: Bureau of Publications, Teachers College, Columbia University, 1941, p. 275.

[23] *Ibid.*, p. 273.

calls for organization of experience, and if that experience is organized "without reference to conventional subject lines," it is very difficult to see how mathematical learnings can be expected. In a penetrating analysis of the way in which children learn the principles and techniques of problem-solving; Robert L. Thorndike considers the problem of organization and states that "Knowledge which is useful for problem-solving is organized knowledge, organized on the basis of the structure of the field and in terms of significant generalizations, organized by the learner and applied by him in a variety of contexts." [24]

There are undoubtedly large values achieved through the organization of core activities "without reference to conventional subject lines," and the importance of these outcomes cannot be discounted. To assume, however, that such procedures are effective in the learning of mathematics is to contradict the authority of experience. From the influential pen of John Dewey,[25] whose theories of education have exercised a large influence on the nature of the "core curriculum," comes the statement that:

> . . . it is as true of arithmetic as it is of poetry that in some place and at some time it ought to be a good to be appreciated on its own account—just as an enjoyable experience, in short. If it is not, then when the time and place come for it to be used as a means or instrumentality, it will be in just that much handicapped. Never having been realized or appreciated for itself, one will miss something of its capacity as a resource for other ends. . . .

By what peculiar process of learning can mathematics ever come to be recognized as "good to be appreciated on its own account" if it is decomposed into a "multitude of relatively unrelated connections or facts"? How can any student ever capitalize on its great "capacity as a resource for other ends" when he has been denied the generalizations which transfer make possible? There is no assurance that mathematical skills used successfully in one situation will be available for use in another situation. Generalized understandings are needed, and the development of mathematics understandings of this kind would be greatly impeded if not prevented when learnings are organized "without reference to conventional subject lines."

One of the great strengths of the core program is found in the classroom procedures associated with this curricular development. Pupil participation in the defining of problems, the gathering of relevant data, the organization and interpretation of those data as well as formulating and validating hypotheses are educational experiences in a very real sense. But these are procedures which may also be used with great effectiveness by teachers of mathematics, and perhaps one way in which we can improve the quality of our program is to provide for such activities in our own classroom. Mathematics is in the "core" by virtue of the fact that it is "basic for all students."

[24] Thorndike, Robert L. "How Children Learn the Principles and Techniques of Problem Solving," Chapter VIII, *Learning and Instruction*, Forty-Ninth Yearbook, Part 1, National Society for the Study of Education.

[25] Dewey, John, *Democracy in Education*. New York: The Macmillan Company, 1930, p. 281.

Let us teach it in such a manner that it is recognized by both students and faculty as "a good to be appreciated on its own account." Generalized understandings are essential if "its capacity as a resource for other ends" is ever to be appreciated, and generalized understandings are the outgrowth of experience rather than the basis for it.

G. A SUGGESTED COURSE OF STUDY IN MATHEMATICS

JOHN R. MAYOR

Introduction

IT HAS been suggested by the committee preparing the materials for this issue of THE BULLETIN that one contribution should deal with specific recommendations on a course of study in mathematics for grades 9 to 12. Such is the purpose of this paper. It is not the intention to set forth a prescribed program which should be followed by all schools, but rather to outline briefly one type of program which might serve as a guide in evaluation by schools of their present courses of study and in planning desirable modifications. The program described here is for the most part in operation at Wisconsin High School, the laboratory and demonstration secondary school of The University of Wisconsin.

It is my belief that the needs of our times, as ably set forth in Chapters I and II, make highly desirable, if not absolutely necessary, the offering of four years of mathematics in grades 9 to 12 for those pupils with the aptitude, achievement, and interests which would enable them to be successful in the study of secondary-school mathematics through analytic geometry and an introduction to the calculus. At the same time the needs of our day, as seen in relationship to the present school population and a reasonable mathematics achievement in the grades of the elementary school, make highly desirable, if not absolutely necessary, the offering of a two-track or multiple-track program in grades 9 and 10.

The course of study outlined is based on this recognition of the real need for a four-year program for the mathematically gifted and those who will become the technicians and scientists of tomorrow, of course by no means mutually exclusive groups, and for a sound program in which the "lower fifty per cent" can be successful and from which they can reasonably be expected to profit. The recognition of the importance of understanding in the learning of mathematics and of the desirability of considering both logical and psychological factors in building the course of study has been significant in the development of the course of study proposed.

Teachers of mathematics have learned from modern educational psychology

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and from experience that pupils grow in mathematical power if they understand the topics which they study. Many of the authors in this mathematics number have called attention to this and rightly so, for there is no more important point that could be made in an analysis of secondary-school mathematics. This principle that pupils learn best when they understand the mathematical ideas they are studying is the first principle to be applied in determining the course of study.

The present, too much publicized, controversy, between so-called academic professors and professors of education, arises in part from a belief on the one hand that the other group disregards the logical implications of subject matter, and on the other that too little attention is paid in traditional mathematics sequences to psychological factors. In some general mathematics courses of our day, sight of important logical aspects of mathematics is lost; and in the traditional subject matter divisions in secondary mathematics, full advantage is not always taken of knowledge of psychological factors. Both points of view are of great importance in planning the course of study, as is closer co-operation between those who at present sometimes seem more ready to criticize each other than to work together toward the improvement of our schools. In mathematics particularly, the asssistance of both groups is greatly needed.

The program proposed is not an extreme program in the sense that it would be difficult to put into effect in any school with a more traditional course of study, nor one which will cause difficulties for transfer students. It is recognized that there is a risk in presenting proposals of this kind without adequate space to analyze the arguments for and against them. However, many of the articles of this mathematics number do present arguments which might be given in support of the proposals to be made.

A Course of Study

Grade 9

MATHEMATICS *9g.*	A continuation of the *general mathematics* of grades 7 and 8.
MATHEMATICS *9s.*	A first year of *algebra* with emphasis on relations to arithmetic and applications in geometry.

Grade 10

MATHEMATICS *10g.*	A continuation of the *general mathematics* of grades 7, 8, and 9.
MATHEMATICS *10s.*	*Plane geometry*, with topics from solid geometry and trigonometry.

Grade 11

MATHEMATICS *11.*	*Intermediate algebra* and *trigonometry*.

Grade 12

MATHEMATICS *12.*	*Elementary mathematical analysis*, including topics traditionally in college algebra, trigonometry, and analytic geometry; and an introduction to calculus.
MATHEMATICS *12c.*	*Consumer mathematics* (one semester)

POSSIBLE MODIFICATIONS FOR THE SMALL SCHOOL

Rather than give a separate course of study for the high school too small for the above course of study, possible modifications are proposed under five points:

1. In the school too small to have two mathematics sections in grade 9, Mathematics 9g and 9s might be offered in alternate years. Students who are ready for 9s as determined by some of the criteria given in other articles of this publication by McDaid [1] and Potter [2] should not take 9g. In some small schools, the two courses 9g and 9s are offered by the same teacher at the same hour, under a plan of ability grouping within the class. This arrangement is preferable but requires an unusually skilled teacher.

2. Even the smallest high school should offer mathematics 10s at least in alternate years, or provision should be made for this course to be taken by correspondence study. A course like Mathematics 10g has not been offered by many schools until recent years, since good texts for such a course were not available. It is strongly recommended that such a course be offered at least in alternate years by small schools.

3. Administrators in some small schools may feel that courses Mathematics 11 and Mathematics 12s are out of the question. The best solution in this case is again provision for those interested to take these courses by correspondence. It should be recognized that average and gifted pupils attending such a school will be seriously limited in future professional opportunities and at least somewhat limited in important aspects of general education, unless some special provision, as proposed, is made for a study of mathematics beyond formal geometry.

4. While the offering of courses covering the content of Mathematics 11 and 12s in alternate years has to my knowledge been tried on a limited scale only, a plan like that used in Kirkland, Illinois,[3] appears to have genuine merit. It is hoped that experimentation with this kind of plan will be carried on, on a wide scale in the next few years.

5. The small school will probably not find it possible to offer a semester of consumer mathematics and, consequently in these schools, more attention can be given to consumer topics in the general mathematics courses.

ON CONTENT OF THE COURSES

Grade 9

In mathematics homogenous grouping as early as the seventh grade seems almost necessary. It is unreasonable to expect that, in a subject as cumulative by nature as mathematics, the whole school population with its great range of abilities and interests can be ready to study the same topics at a common level and to move forward at the same pace by the time of the junior high school. The widely accepted pattern of the double-track program of algebra

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[1] McDaid, Elmer W. "Determining Individual Needs Through a Guidance Counseling Testing Program," THE BULLETIN of the National Association of Secondary-School Principals, Vol. 38, No. 203, May, 1954, pp. 88-96.

[2] Potter, Mary A. "Mathematics for the Lower Fifty Per Cent," THE BULLETIN of the National Association of Secondary-School Principals, Vol. 38., No. 203, May 1954, pp. 96-103.

[3] Mock, Gordon. "A Mathematics Curriculum for a Small High School." *The Mathematics Teacher*, XLV (1952): 589 and 593.

and general mathematics for the ninth grade seems at present to offer the most promise. It is my recommendation that in the double-track plan, all of the courses be called mathematics and be listed with an identifying letter such as 9g or 9s. It must be recognized that all of these courses are an extremely important part of the school program. When provision is made for ability grouping, mathematics in the ninth grade should be required.

While at present the courses of the double track may be widely different, each school and every teacher should make a special effort to see that the planning for both profits from the experiences in the other. For the past fifty years we have talked about the desirability of breaking down the artificial lines between algebra, geometry, and trigonometry in secondary-school mathematics. The present widespread acceptance of general mathematics beyond the eighth grade for pupils of less mathematical interest and aptitude is doing much to bring about this desirable result.

Probably the single report of a commission or a committee of the National Council of Teachers of Mathematics which has had the most widespread influence has been that in which were listed the twenty-nine minimum essentials for mathematical competence.[4] This list provides a sound basis for determination of the content of general mathematics courses at the junior high-school level. At no time since this list was first proposed has there been much disagreement with it. Some have proposed that the reference to trigonometric functions and vectors and some of the straight-edge and compasses constructions should be omitted from a minimum list. It has been suggested that scientific notation might be added and that additional questions might well give direct attention to quantitative thinking needed in reading newspapers and magazine articles, to functional relationships, and to appreciations. The list stands in any case as a superior check list in developing the course in general mathematics at the ninth-grade level.

For those who are ready to go ahead more rapidly with generalizations, the more abstract processes, and the greater use of symbols, Mathematics 9s must be offered. These pupils must not be held back in their mathematical development by a continuation of a study of topics already understood from the seventh- and eighth-grade work. The study of algebra can be so directed that understanding of the ideas of arithmetic and intuitive geometry can be strengthened and deepened, and at the same time the skills necessary for everyday life can be maintained and improved. Our schools must continue courses to serve the same purposes as the so-called traditional courses. When two tracks are possible, students in the track which begins with algebra must progress to the ideas of the calculus as soon as possible. Algebra is a very important step in this progress.

[4] Schult, Veryl. "Guideposts in Curriculum Planning in Mathematics," See above, chapter III, section A.

In some schools a third track may be possible and quite desirable. For one who believes in ability grouping, this can only be welcomed. This third track course is often, in large part, remedial arithmetic. Reports from schools where a third-track course is offered are, almost without exception, enthusiastic. In some communities it is desirable to offer special courses called vocational mathematics or shop mathematics and, in some instances, mathematics of agriculture. While for most situations the courses proposed here should meet community needs, there is no desire on the part of this writer to discourage more specialized courses where very special needs exist.

Grade 10

Our schools should provide appropriate opportunities in mathematics in the senior high school on an elective basis for all students, but I do not personally favor a requirement beyond the ninth grade on a state or national basis. In some schools it may be necessary and desirable. The requirement at this level most justified is one in terms of minimum essentials under which those not meeting minimum standards would be required to take work of a remedial nature in the 11th or 12th grade.

For many pupils there is need for continuation of the study of general mathematics beyond the ninth grade. This would be especially true for those who have not been successful in reading the minimum level of achievement suggested by the list of twenty-nine minimum essentials. Many other pupils can profitably be carried beyond the minimum essentials with more work in algebra and an introduction to demonstration in geometry. Mathematics 10g is proposed to meet these needs. In some schools an attempt is made to cover a first year of algebra in two years of general mathematics and in others, especially with a large percentage of college preparatory pupils, a geometry course is offered at two or three levels. A second year of general mathematics provides an opportunity for boys and girls who may not be interested in or ready for formal geometry or intermediate algebra to continue to have sound direction in the learning of important mathematical ideas.

The need for technically trained personnel imposes on us a special and vital responsibility to make our sequential courses as good as they can possibly be and to make sure that students and guidance people know what training in these courses has to offer, both to our students and to the national security.

The course in our curriculum most justly under question is formal geometry. This is reflected in the texts available for this course. Geometry is the course for which one can most easily advise a teacher who seeks advice on the choice of a text, in terms of the kinds of emphases he wishes in his course. If he wants a more informal geometry with applications, then there is the green text; one with emphasis on reasoning in non-geometric situations, the black

one; an experimental approach with many originals, the pale blue, thick one; frequent correlation with algebra, the gray; emphasis on logic in geometry and formal proof, the brown. That this situation exists is characteristic of the current variation in content in the tenth-grade course—a situation with which I for one am not wholly unhappy.

The primary objective in Mathematics 10s is the acquisition of the understanding of the nature of proof in geometry and the nature of a logical sequence of propositions in geometry. The teacher must recognize that the transfer to other situations of the ability and disposition to think critically and logically in geometry is never automatic. Opportunities to show the importance of definitions, assumptions, converses and opposites, and the meaning of the terms undetermined, determined, and overdetermined in non-geometric situations should be sought and used.

At least six weeks of Mathematics 10s can appropriately be given to properties of solid figures, either in introduction to analogous properties in the plane, following analogous properties in the plane, or at the end of the course. Opportunities should be provided for use of algebra in analysis and proof of theorems. A unit on co-ordinate geometry including mid-point of a segment, distance, and slopes of lines can be a valuable part of this course. A study of indirect measurement, using trigonometric functions, certainly closely related to some of the topics in plane geometry, also has a place in Mathematics 10s. Naturally if these new materials are to be introduced there will necessarily be a decrease in the number of theorems of plane geometry, formerly in the course.

Grades 11 and 12

A third year of mathematics should be devoted to intermediate algebra and trigonometry with approximately two thirds of the time given to algebra. There is no sound reason for separating the algebra and the trigonometry in the course, but there is the practical one that texts on algebra and trigonometry as a continuous year's course, suitable for high-school classes, are practically non-existent. There is a trend in some parts of the country to offer a second year of algebra. The desirability of closer integration of the concepts and topics of algebra and trigonometry, with some attention to topics from analytic geometry, seems to outweigh any supposed logical advantage of the continuous second year's work in algebra. The total picture of needs of boys and girls ages 14-18 does not seem to justify separate semester or year courses in statistics or mathematics of finance. The better new algebra texts are making more adequate provision for these topics in closer psychological and logical relationship to the more abstract mathematical ideas on which they are based. The very large high school with a special student population may find, of course, these courses of special advantage.

The fourth-year course, Mathematics 12s, which might be called elementary mathematical analysis, includes topics from college algebra, trigonometry, and analytic geometry, with an introduction to the calculus and some statistics and business mathematics. The work in trigonometry, with the preparation provided in the eleventh grade, should include polar co-ordinates and the use of trigonometric functions in representation of complex numbers. The spreading of the trigonometry, even though covering less than one complete semester's work, over parts of three years, beginning with the introduction to solution of triangles in the tenth grade, very definitely helps students in obtaining facility in the use of trigonometric functions in applications in science and mathematics.

While another six weeks' work in solid geometry with emphasis on computation and use of formulas can be given in the fourth-year course, my preference would be for a unit in analytic geometry in three dimensions as an extension of plane analytic geometry. In one of the best new texts in elementary mathematical analysis, quite suitable for use in the fourth-year high-school course, the material on the circle and the sphere is given in a single chapter.

Many colleges and universities of the Midwest are now following the plan adopted earlier by eastern colleges of offering calculus to freshmen. A new sequence of courses has recently been inaugurated for freshmen at The University of Wisconsin in which the first course is analytic geometry and calculus. The work previously done in four semesters in completing a year of calculus is now completed in three semesters. While entering freshmen may take college algebra and/or trigonometry, those who have to do this are seriously handicapped if they hope to pursue mathematical, scientific, or technical courses. This suggests some adjustment in secondary-school mathematics. Such adjustments should be more possible in schools which practice ability grouping.

A semester of consumer mathematics offered in the senior year in Milwaukee high schools meets a real need of many students to become more familiar, from the point of view of the application of mathematical concepts involved, with interest and discount, taxation, insurance, and other topics important for every citizen. The last year in high school is the best time for students to study these topics, which have sometimes had too great a place in the arithmetic of grades 7 and 8.

In quite a number of schools, an arithmetic achievement test is given to juniors or seniors so that those who would be handicapped in most any kind of vocation by weakness in the skills of arithmetic might be advised or required to take a remedial arithmetic course. The practice should be less necessary when a larger percentage of pupils not now taking mathematics in grades 9-12

have the opportunity to study topics important for them in such courses as Mathematics 9g and 10g.

In mathematics we find ourselves accepting a responsibility to help boys and girls work toward the goals of the secondary school by leading their activities in the area longest organized as a special area in all of the curriculum. We find because of the long-time traditions in our special area that some of the approaches to education of our time seem more difficult to apply. We know that our critics much too easily say that we are teaching mathematics rather than teaching children. At the same time we recognize that mathematics is an instrument which is used to contribute to human comfort, health, economic sufficiency, and community understanding, and that concepts which are pervasive in mathematics are also crucial in democracy and basic in both a broad and limited view of problem solving. For these reasons, and others, we are confident of the place of mathematics in general education. We know also that secondary-school mathematics is necessary preparation for many of the most important vocational and professional responsibilities of our day.

In this mathematical age we have a challenge greater than ever before to plan the mathematics course of study so that we can more easily meet the needs of *all* pupils and so that their experiences in the secondary school will be of maximum value to them in reaching their greatest potentialities, for themselves and for society. To meet such a challenge, any course of study must be subject to periodic evaluation and resultant strengthening.

Chapter IV.

Provision for Individual Differences

A. DETERMINING INDIVIDUAL NEEDS THROUGH A GUIDANCE COUNSELING TESTING PROGRAM

ELMER W. McDAID

A FUNDAMENTAL problem in every student's life is adjustment. His success or failure in school is largely due to his capacity for modifying his reactions to conditions under which he must live throughout his school career. The individual process by which these changes take place is called learning, and the results, education. The function, and responsibility, of the school is to provide optimum conditions in which these changes can take place. The role of the teacher in mathematics and in other fields is to stimulate and guide the learning process. This function may be termed educational guidance.

The major purpose of the following discussion is to cite a few basic assumptions, methods, and promising procedures that are incorporated in a new program of guidance and counseling testing introduced some five years ago in the Detroit Public Schools. Although this program cuts across all subject matter lines, the major implications are pointed toward mathematics instruction and programming in algebra and general mathematics. At present there is almost unanimous agreement among the secondary-school counselors and curriculum directors that student evaluation should be continuous and functional throughout the grades—elementary through the secondary.

BASIC ASSUMPTIONS UNDERLYING THE NEW AND THE OLD TRADITIONAL TESTING PROGRAMS

A teacher's effectiveness mainly depends upon what his students learn and the adjustment they make to any particular subject. The basic approach to this fundamental problem was that of developing an adequate testing program for the purpose of evaluating a student's potential and expressed needs. This procedure was undertaken by a large representative committee of teachers, principals, and curriculum directors. The formulation of basic assumptions and background thinking was the first step undertaken to develop the

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experimental design of the new program which provided the data and a cumulative record of student progress from the elementary- through the secondary-grade levels. Their point of view concerning the guidance and counseling testing program is expressed briefly in the following statements:

1. The guiding philosophy is that measurement of mental abilities, academic achievement, personal characteristics, and student interest offers the most solid basis on which students may be assisted in their future educational and occupational pursuits; further, that test results provide more valid measurement when they are obtained over definite periodic intervals. The major purpose of all educational measurement is to enable the teacher and the counselor to base their evaluation of a student upon reliable, objective, and comparable information as free as possible from the usual errors and biases of subjective opinion. Using test results with other pertinent data means taking into consideration physical and health factors, aspirations of the students and parents, extracurricular activities and interests, environmental factors, and special abilities and disabilities.

2. A comprehensive cumulative student record must be started at an early elementary level and must follow the student through the twelfth grade. This means, a student record form available and in the hands of mathematics teachers at all grade levels and not simply a permanent record residing in the files of the central office. Any program that attempts to utilize test data and student background information without a cumulative record readily available and in the hands of the mathematics teacher will find its purpose sterile of any true value.

3. The first responsibility of the teacher of mathematics is to become intimately and reliably acquainted with each student, in order that instruction and guidance may be best adapted to his individual requirements. This responsibility should hold equal importance with control of the subject matter taught. Teachers may no longer ignore the fact that some students can never succeed in regular school work, while pupils with low ability may nevertheless be able to work and achieve in a different type of educational environment. In the past, the low-ability student has been too frequently discovered only through failure. Instead of being counseled and encouraged to master work at his own level of operation, the student has been taught to fail. On the other hand, the high-ability student has often been neglected by the teacher's inability to recognize his potential. Thus it is the inherent responsibility of each teacher to discover and record the strengths and weaknesses of his students. In this way the principle of individual differences is an integral part of the program.

Thus the major purpose of testing and evaluation is to improve the quality of mathematics instruction by helping teachers make their offerings more appropriate to the individual student. This assumption does not imply that educational tests serve no other purpose. However, it does imply that the major value of educational tests should reside in their use and application to educational guidance and in the adjustment and adaptation of instruction to individual student needs.

4. It is the inherent right of each student to be given the opportunity to progress as rapidly as he can, or as slowly as he must. Mathematics teaching is a continuous process in which, by skillful guidance and counselling, the development of the student is guided on the basis of his potential and his previous growth. If maximum mathematical growth of each student is the aim of the teacher, then a measure of the student's abilities, readiness levels, and progress must be recorded at periodic intervals.

5. Teachers should not restrict their testing to subject matter areas exclusively. Measurement in academic achievement should be augmented by measurements of the

student's personal and social adjustment with a view of promoting maximum growth and development of the student. For instance, the mental health of a student is the responsibility of all teachers, including mathematics teachers.

6. Mathematics teachers must assume the responsibility of accepting students where they find them—intellectually, academically, socially, and chronologically. Any evaluative instrument or test is justified if it provides a teacher with additional information concerning a student's strengths, weaknesses, and potentialities.

7. A guidance counseling testing program cannot be decreed by administration without understanding or participation on the part of all teachers and counselors. If the program is to succeed as a functional part of the educative process, the purpose must be formulated and accepted by all—teachers, principals, supervisiors, and administrative heads. This calls for a well-organized program of in-service education for the entire school staff. The program must cut across all subject-matter lines and involve all staff members. Furthermore, the responsibility for guidance must be shared by teachers and counselors alike, each performing his function to meet the individual needs of the student.

For the reader to appreciate and understand fully the reasons responsible for the change from a traditional testing program to a guidance counseling testing program, a brief statement describing the limitations of the old is in order.

In the past, the traditional testing programs were most frequently associated with unhappy emotional experiences on the part of both teachers and students. This was due to the fact that testing, as such, emerged from the central office and was largely used for making comparisons between students, classes, and schools. By and large, this practice resulted in a rather meaningless procedure in which tests were administered in a prescribed manner, scored, tabulated, and returned to the central office. The practice led to the rather vicious idea that the teacher was being evaluated rather than the student. In this setting it was little wonder that teachers developed a dislike for any comprehensive testing program. Space will not permit elaboration on the unfortunate assumptions used as bases for this type of testing. However, perhaps a brief statement of four rather major assumptions will suffice to make the transition clear from the traditional testing program to the program being discussed. Briefly, they are as follows:

1. Superior teachers are grade specialists, with methods and techniques adaptable solely for a particular grade level.

2. A mathematics course of study implies uniform presentation to all students.

3. A testing program should be the sole determiner for student promotion to the next rung of the educational ladder.

4. By intensifying instruction, all students can be brought up to an established standard.

Perhaps the most frequent abuse of test scores in the traditional program was that they were used in isolation and to the exclusion of all other pertinent information regarding students. Students were often counseled on the basis of a single intelligence quotient without reference to any other

information. In the same manner, students were promoted or failed by a single raw test score in mathematics.

In summary, it should be emphasized that rigid promotion policies, uniform standards of achievement, and the purpose of testing programs of an earlier day often stood in the way of, or at least handicapped, mathematics teachers in their efforts to provide for individual differences among students. Although more complete statements, descriptions, and assumptions would be necessary to understand and evaluate fully both types of testing programs, this brief discussion should enable the reader to appreciate the transition from a purely traditional subject matter testing program to one of testing for purposes of guidance and counseling.

THE GUIDANCE COUNSELING TESTING PROGRAM

The program under consideration requires administering the tests to all students in the fifth, seventh, and ninth grades the second week of each semester. In order to make this information uniform throughout the school system, it was made mandatory for every student to take the tests during the designed period. Not only does it set aside a definite period for which grade teachers have been delegated a definite responsibility, it also gives emphasis and intent to the program. First, it provides the teachers and counselors with pertinent guidance information concerning each student. In this manner the individual student and class needs may be identified. Second, by administering the tests in the same month each year, the gains and losses for each student may be compared with equal periods of educational growth without mathematical computation. Third, it provides a definite city-wide plan for obtaining the basic test data deemed necessary for the success of the program.

The scope of the tests enables the teachers to obtain and evaluate the following information concerning each student:

1. Arithmetic scores (grade equivalents) in vocabulary and fundamental knowledge, whole numbers and fractions, percentage and decimals and problem solving.
2. Reading scores (grade equivalents) in comprehension and vocabulary.
3. A student's background inventory designed to be a simple fact gathering and interest inventory to aid mathematics teachers in becoming acquainted with new students.
4. A general intelligence score expressed in a letter rating for each student. This information is provided by the psychological clinic which administers intelligence tests to all students at the first-, fifth-, eighth-, and twelfth-grade levels.
5. An algebra aptitude test score expressed in percentile status. This test is administered to eighth-grade students only.

These test data are recorded on the student's guidance counseling test and information record by the teachers who administered the tests. It is strongly recommended that this rather large clerical task be accomplished in the regular designated testing period. Although this requirement is exacting and time-con-

suming, teachers are in agreement that the success of the program is largely dependent on the completion of this initial step. Designated columns and adequate space has been provided to make the task as simple as possible for teachers.

The following illustrations shows the format of the record form and the actual test data recorded for Mary Smith at the required grade levels.

GUIDANCE COUNSELING TEST AND INFORMATION RECORD

NAME .... BIRTHDATE ....

				8th Grade Special Testing	
SCHOOL	Roe	Roe			
GRADE	Grade 5	Grade 7	Grade 9		
LATEST L.R.	B	B-	B-	Gen. Aptitude L.R.	
DATE	10-4-49	10-8-51	10-5-53	Clerical	B
Iowa Arithmetic:				Mechanical	C
I	52	67	84	Intelligence	B-
II	57	72	84	Algebra Aptitude	45
III	52	69	83		
TOTAL	54	68	84		
Iowa Reading:					
I	43	68	92		
II	57	77	92	English Usage	75
TOTAL	47	73	92		

ANECDOTAL RECORD

Special Abilities, Interests, Emotional or Social Traits, Environment

Counselors and mathematics department heads use this information in programming 9B students for algebra or general mathematics. The value to the high school depends entirely upon the effort expended by their staff to interpret and evaluate these test data.

METHODS AND TECHNIQUES USED IN PROGRAMMING

The introduction of general mathematics as an alternate course to algebra in the ninth grade created the problem of how best to select the right students for these courses. In the beginning some schools permitted all or nearly all of their 9B students to take algebra, and at the end of the first semester they made a separation based entirely on the teacher's final mark. Other schools relied entirely on a single algebra aptitude test score for sectioning their incoming 9B students. Students falling below the thirty-fifth percentile rank were programmed in a general mathematics section, at least for the first

semester. Although the latter method indicated some improvement over the former, a rather high failure rate persisted under each method. It was at this point, administration and supervisor strongly recommended that the high schools fully utilize the cumulative test data secured in the elementary schools for programming 9B mathematics students.

Although the schools developed various methods for handling these data, Detroit high schools have adopted this procedure and have experienced reasonable success over the past five years. The general procedures employed can best be described by outlining the two rather characteristic methods developed by two of our largest schools.

Method One may be designated as the multiple standard achievement method. In brief, it is the policy to evaluate the student's test data while he is still in the last half of the 8A grade. By and large, a student is programmed for algebra if he is above the thirty-fifth percentile on the *Detroit Algebra Aptitude Test*, obtains C or above on the *Detroit General Aptitude Test*, and achieves a grade equivalent of eight or better on the standardized arithmetic and reading tests. All students who are not programmed for algebra are placed in general mathematics sections. However, this line of demarcation is not entirely inflexible, as the above criteria are not rigidly applied without interpretation and analysis of other pertinent factors.

Method Two may be termed the index number technique for consolidating the student's test data prior to programming. Exactly the same materials are available to the high school employing this method as was described under Method One. Counselors and mathematics heads had identically the same problem; namely, one of evaluation and interpretation, the only difference being one of procedure. Under Method Two, an index number is first computed for each student and then used as a reference point for programming. In determining the student's index, weights are assigned to the intelligence letter ratings derived from the intelligence part of the *Detroit General Intelligence Test*. Next, the scores obtained from the reading and the arithmetic tests are converted to grade equivalents and weights assigned to these levels. In a like manner, the percentile derived from the algebra aptitude score is given an index number. Then, the average weight for the reading, arithmetic, and the algebra tests is added to the weight of the *Intelligence Test*. Finally, the sum is divided by two to obtain the student's index number. By this method each student is given an index number ranging from one to twelve, and on this basis his classification as 9B algebra or general mathematics is determined.

Regardless of the method employed, one reason for this classification procedure is to achieve a degree of homogeneity in the 9B class sections. Since there may be many 9B mathematics sections in a large city high school,

it can readily be seen that the difference in ability between the highest and the lowest sections will be very marked. For example, the reading and arithmetic ability of the lowest group may be, and frequently is, near the fifth-grade level. This information helps the mathematics teacher modify his teaching in terms of the level of ability for the groups. It should not be inferred that the students in any particular section are alike with respect to interests, aptitudes, abilities, and achievements; however, the range of these abilities is much smaller than it would be under a system of classification in which no attempt at ability grouping is made. Not only does this procedure help the mathematics teacher in fitting his instruction to the level and needs of the class group, but also the nature of the courses assigned varies considerably from the low to the high groups.

If a student had no intention of going to college, and it seemed his interest might be better served by instruction in a general mathematics course, he would be programmed for this course rather than algebra, even though all his test data indicated he should achieve far better than average success in algebra. Conversely, if a student definitely planned to attend college, he might be permitted to try algebra even though his test data indicated he may encounter difficulty. The score on a particular test does not arbitrarily assign a student to one course or another, but considered judgment on the part of the student, mathematics department head, and the student counselor enters into the decision. Many times a student's subsequent achievement changes, and, in light of these changes, reassignments often occur. If a student is placed in general mathematics, he may transfer to algebra later if his record of achievement indicates he may profit by the change. Conversely, a student placed in algebra may change to general mathematics without losing credit providing, of course, he achieves the minimum standards for the course.

Most high schools have found it desirable to acquaint individual students with their algebra aptitude and standard test scores as soon as possible. These test data are then recorded on the student's 9B Curriculum Selection Sheet and sent home for the parents' approval. The counselor's suggested recommendation for algebra or general mathematics is written on the back of the form. It is strongly suggested to parents that students follow the recommendation. However, if a student has a low percentile status in algebra aptitude, but it is the parents' expressed wish for him to take algebra in spite of the warning of possible failure, he is still permitted to do so.

Since no method or procedure is infallible and many factors besides ability contribute to success or failure in algebra, the student's progress is carefully observed during his first semester's work. When a teacher finds a student doing poor work, it is suggested that he transfer to general mathematics at the close of the semester without losing credit for the semester's work. Nearly all such pupils accept such an "out" to their mathematical difficulties.

Although there has been no city-wide evaluation of the program, many individual schools have carried on their own. The following is characteristic of such studies and, in general, the findings agree with those of other high schools.

This study points out that many factors are involved in students' failure, but two seem to be rather consistent and obviously influence the programming of students on the part of counselors and department heads: (1) the point of view and standards that mathematics teachers hold for their students in teaching the subject; and (2) the degree of success with which students can be guided into subjects for which they have the requisite aptitudes and preparation. Assuming that these factors determine in a large part the success or failure for students, then, in the case of algebra and college preparatory subjects, a low failure rate will depend on proper selection of students for courses.

The guidance and counseling testing program is designed to accomplish this purpose of proper selection at the high-school level. The following findings of the same study appear to bear this out. Students were selected for algebra (1) and (2) in the ninth grade on the basis of all the available data described above. This information was in the hands of the mathematics department head and the counselor the tenth week of the 8A grade. However, in the tenth grade, students were admitted to algebra (1) and (2) on a much more liberal basis. The difference in achievement was pronounced, although the content of the course in algebra remained constant. In the 9B grade only two per cent of the students for this particular semester failed, while thirty-six per cent of the 10B students failed. In the 9A there was ten per cent of failures as compared with thirty per cent for 10A.

On the basis of the findings of this study and similar ones, it may be concluded that the program is achieving a considerable degree of success. The program was further evaluated from the standpoint of the students. Here are some findings:

1. If a student who definitely lacks the prerequisites, aptitudes, and preparation for a subject can be guided to make other choices, there will surely be less chance of failure, with a resultant saving of his time as well as a reduced likelihood of encountering frustrations and other difficulties which frequently result from failure.

2. It must be recognized that there are some borderline cases where the data are not conclusive as to whether a student will or will not succeed in first-year algebra. In these cases, if the course would really serve a useful purpose for the student (if passed), there probably should not be too many obstacles put in the way of his attempting the course.

3. In a few cases, even though the data definitely indicate the likelihood of failure, students and/or their parents are unwilling to admit the force of the data. Frequently in such cases it is a good, sometimes the only, guidance procedure to permit these students to take the course.

In a sense, the program of testing, with the cumulative record which follows the student through school, is a method of making longitudinal studies of students periodically and systematically. One important aspect of this method is that it reveals mathematical growth at two-year periods. The present program is securing this measure of growth at the fifth-, seventh-, and ninth-grade levels. At present, the intention is to expand the program to include the third and eleventh grades as well. Many schools have already gone beyond the compulsory request of the program and are testing on an annual basis instead of bi-annually. Cumulative records kept throughout the elementary grades make it possible for high-school mathematics teachers to provide a more meaningful type of instruction.

It is not to be inferred that test scores alone make this possible. The value emerges from the use of standardized tests and evaluative instruments at regular intervals to reveal the longitudinal pattern of growth, together with other pertinent information.

B. MATHEMATICS FOR THE LOWER FIFTY PER CENT

MARY A. POTTER

IN THE days of the little red schoolhouse, several paths were found at its exit and only one of them led to the high school. This path was traveled by academically minded pupils or by those with parents whose financial success made college a social requirement. In the secondary school they attended, the study of algebra and geometry was routine. As attendance laws became more stringent and educators found that keeping Johnnie in the fifth grade for three years was poor practice, no matter how low his achievement, other paths from the exit of the elementary school became choked with difficulties and the road to the high school was widened and paved to accommodate all or nearly all of the pupils. With a new high-school population differing widely in intelligence, in ambition, in vocational plans, in cultural background, and numbering nearly twenty times the school of sixty years ago, the secondary-school principal has been faced with the problem of what mathematics, if any, should be offered to the high-school pupils of today.

Theory reinforced by experience has proved that requiring the traditional courses for all pupils is not the correct solution of the problem. Thorndike [1]

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[1] Thorndike, Edward L. *The Psychology of Algebra.* New York: The Macmillan Company. 1928. pp. 31-37.

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found that an IQ of about 110 was necessary for an adequate mastery of algebra, which is a level of intelligence greater than that found in the lower fifty per cent of our entire high-school population.

PROVIDING OPPORTUNITIES FOR THE SLOW LEARNER

Experience has also proved that requiring no mathematical training for the slower pupils is not the correct solution of the problem. This easy answer was accepted in the 30's by many principals who realized that failure in traditional courses caused a larger number of boys and girls to leave school, and who knew that these young people would never need credit for college entrance. But further study and the critical lack of competence in mathematics revealed during World War II disclosed the fact that a mastery of basic skills and information by all boys and girls is necessary for efficient living as well as for self-preservation. Since this required mastery has seldom been gained before the lower fifty per cent of the pupils reach the secondary school, it is obvious that necessary mathematics must be taught and that it must be fitted to the lives the pupils will probably lead rather than preparation for college, which is the chief aim of the traditional courses.

Some schools have retained the time-honored method of solving the problem by failing those pupils who are unable or unwilling to meet the regular standards. Other schools have compromised by passing everyone or nearly everyone with a subsequent deplorable lowering of requirements.

For groups not too diverse, the use of differentiated assignments has proved to be helpful. But care must be taken to have these assignments differ not in quantity but in quality of effort required.

Another helpful device is the opportunity room in which a competent teacher does individual remedial teaching of a few boys and girls. The pupil is assigned to this room for a short period of time to make up work missed during absence or to correct a specific weakness observed in the regular classroom.

When individual differences in ability and achievement are great, a more drastic treatment is indicated. Maximum results can be obtained when different courses of study and different textbooks are used which are fitted to the needs of the pupils studying them. One method of administering this plan is to divide a class into two groups of comparable ability; another is to organize classes of comparable ability, the so-called two-track plan. Having two quite different groups within one class is a common practice in teaching primary reading, a plan which elementary-school teachers have worked out with success; but keeping all the boys and girls working at capacity while the teacher gives her main attention to the other group requires most efficient organization and teaching skill.

HOMOGENEOUS GROUPING

Homogeneous grouping has long been a subject for debate by administrators and other teachers. Those opposed to such grouping say that it is undemocratic; those in favor reply by asking if it is undemocratic to give children the education best suited to their needs and abilities. Another argument offered against homogeneous grouping is that with such a plan slower pupils lack the inspiration of the best minds. Their argument is answered by asking how much inspiration comes to the slow pupil who must constantly compare his inferior work with the superior achievement of the brighter pupils, which he knows he can never hope to equal and probably cannot understand, which, instead of being an inspiration, usually produces an inferiority complex.

Again, those who oppose the two-track system say that such grouping brands certain children as "stupid" and others as "bright." They receive the reply that with sympathetic teaching the classes need not be so labeled and, moreover, outside the schoolroom boys and girls are constantly put into one of those categories by their parents or playmates. Hence, if a label is implied by sectioning, it is no news to the pupil concerned.

It is true that in a few schools sectioning is not necessary because all, or nearly all, of the pupils are of one type; as, for instance, the uniformly bright pupils that are often found in a university high school.

Although no one can deny that the work of assigning pupils in a two-track plan is a burden to the principal, the advantages gained so outweigh the difficulties encountered that most administrators are eager to spend the necessary time on this problem if they are convinced that sectioning benefits both types of pupils. In consequence, ability grouping is increasing rapidly throughout the country.

Sectioning in itself is of little benefit if the standards to be attained, methods of teaching, and courses of study are kept uniform for both sections. But it has been found that when the slower pupils are separated from their brighter classmates, when the course of study, textbooks, methods, standards, and pace of learning are all adjusted to the differing ability, needs, and interests, both groups are given an opportunity to develop to their greatest capacity. When wisely taught, there is surprisingly increased learning in both groups. Also, unexpected social gains result: the brighter pupils are no longer the truly retarded group, the slower classes develop a new set of leaders, and the slower pupils are happier when they are given work that they are able to master.

METHODS OF CHOOSING PUPILS FOR HOMOGENEOUS GROUPS

Most administrators have found that the two-track system rather than a three-track system is the plan of division most practical to attempt because of the difficulties in scheduling the pupils. Usually this assignment of individual boys and girls to the slower group is made by the principal with the advice of the teachers and the consent of the parents.

Because it was obvious that many pupils, even when working to capacity, are only able to go through the mechanics of the traditional ninth-grade algebra without understanding its meaning and applications, it was agreed that their limited achievement was of doubtful value and that they should be separated from their more capable classmates for the mutual benefit of both groups. Upon finding this experiment in sectioning profitable, many schools have observed that even at the seventh-grade level there is a wide enough spread of ability and achievement to warrant a two-track grouping, and they have extended the plan to both the seventh and eighth grades.

In early days of ability grouping, the intelligent quotient was the sole criterion used to determine which pupils should be assigned to the slow or fast sections; but experience has shown that, important as intelligent is, other factors are of great value in predicting the success of the pupil. Among the criteria that should be studied carefully in making such assignments are the following:

1. The intelligence quotient
2. The drive for work possessed by the pupil
3. Teacher judgment of his skill and information in mathematics as shown by his marks and cumulative record
4. Scores on standard tests in both arithmetic and reading
5. The physical health of the pupil
6. His nervous balance or lack of stability
7. The type of course desired by the pupil often dictated by his current vocational plans
8. The wishes of his parents
9. The educational background of the family
10. The economic status of the parents, which often determines whether or not the pupil will need to prepare for college

Because border line cases do exist, because conditions change, and because no human being is infallible in making judgments, it is essential that a two-way swinging door between the faster and slower groups be kept unlocked and freely used.

CHARACTERISTICS OF THE LOWER FIFTY PER CENT

How do the lower fifty per cent differ from the more academic high-school pupils? We are indebted to an unknown but discerning teacher for this apt characterization:

I sit in a class in Latin
    It's Greek to me, you know.
Why should I study it, when English
    Is what I talk to Joe?

Imagine me with baby
    When it begins to cry,
Cooing gently in its ear,
    "R-squared equals pi."

All of these dull studies
    Are ruining my young life.
I don't want to be an Einstein!
    I want to be a wife!

Although the interests of the slower children may diverge widely from those of their brighter brothers, their intelligence differs not in kind but in degree, which is a fortunate fact for both pupils and teachers. In general, the slower children do have a shorter span of attention, they lack imagination, they are not logical, they find abstractions difficult and enjoy the concrete. In consequence, they are weak in forming associations between words and ideas and are notoriously poor readers. Their associative memory is feeble, but in comparison their rote memory is stronger and is one of their happier abilities.[2] It is to be expected that they have little power to transfer training and are not proficient in being able to detect their own errors, an inability which gives them a worse reputation than they may deserve. However, the most important difference between the bright and the slow is that the slow do not have the capacity to create, which is inherent in bright boys and girls.

SELECTING THE TEACHER FOR THE SLOW LEARNERS

A knowledge of these limitations is important not only in planning methods of instruction and topics to be taught, but also in selecting the teachers for the two types of classes. It has been wisely said that "no curriculum that we might formulate can be successful unless we have strong teachers to administer it." Although an excellent teacher is the vital equipment for any classroom, especial characteristics are desirable for successful handling of the slower learners.

The teacher must not be too academically minded but must be willing to take the pupil where he is without reference to any supposed grade level.

[2] Baker, Harry J. *Characteristic Differences in Bright and Dull Pupils.* Bloomington, Illinois: Public School Publishing Company, 1927. Pp. 26-27.

She should have broad fields of interest through which she can contact her pupils, leading them to a knowledge of the value of mathematics and a desire to master it. As to personal characteristics, she will succeed best if she is a good disciplinarian, emotionally stable, yet enthusiastic, with a saving sense of humor, is patient, tolerant, fearless, has great perseverance, is easily adjusted, and so empathetic that she can see some good in every pupil. It is axiomatic that she should know how to present subject matter skillfully, how to organize drill, how to use concrete aids effectively, and that she should be trained in teaching arithmetic.

WHAT MATHEMATICS SHOULD BE TAUGHT TO THE LOWER FIFTY PER CENT?

Courses planned for the lower fifty per cent should be built to prepare for the probable needs of the pupils both in school and in their adult lives. Topics taught should include the mathematics required for use in other school subjects, for consumer and social needs, and for the life occupations that the boys and girls will be likely to pursue. Of especial importance is a mastery of arithmetic, certainly the most useful branch of mathematics and the one which is of additional importance in that the public often uses ability to compute as a measuring stick of the success of our schools.

A checklist of minimum mathematics needed for competent living was prepared by the Commission on Post-war Plans of the National Council of Teachers of Mathematics and has been generally accepted as the basis of courses for less able pupils.[3] It is the best summary yet compiled of the mathematical knowledge and skills necessary for the use of the average citizen.

ADAPTING INSTRUCTION TO THE SLOWER GROUP

Although it is desirable at all times for the teacher to know her pupils, getting acquainted is of basic importance in the instruction of slower pupils. Often apparent dullness arises because of some physical defect which has not been discovered; finding and the subsequent correction of this weakness may result in the transformation of a pupil. It is easy to establish the necessary rapport between the pupil and the teacher if she takes the time to learn about his environment, his problems, his interests, and his ambitions. All youth is plastic, appealing, and responds to kindness. If the teacher lets the pupil know that she likes him, is sympathetic and understands his problems, the battle of how to induce him to master mathematics is half won.

Frequently in the slower group, blocks to learning have been built up which seriously interfere with the pupil's progress. These blocks may be of long standing and stubbornly adhered to, but it is necessary to discover

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[3] Refer to pages 48-54, *"Guideposts in Curriculum Planning in Mathematics,"* Veryl Schult.

them and to break them down before further knowledge or skill can be acquired.

Personality problems more frequently arise in the slower groups. In dealing with these difficult cases, next to sympathetic understanding the teacher's most helpful assistant is judicious praise. Praise should be freely bestowed and generously given whenever it can be honestly conferred.

The first principle in instructing the lower fifty per cent is to keep the pace slow. At their own pace these pupils make satisfactory progress, but they should not even be encouraged to equal the rate of the faster learning group. Because their memories are weak, they need more frequent and more elaborate reviews, which may result in a recurring cycle of review enlarging the previously studied topics.

The meaning theory of teaching arithmetic has had wide acceptance with satisfying results. This may well be extended to the teaching of mathematics to the slower group. If a pupil understands the topic he is studying, if he sees the value and need for the information or skill being presented, he is willing to make the effort to learn and can retain it more securely.

In any teaching one challenge is to isolate the various steps in the learning process in order to present them all to the class. Like little children, slow learners must take smaller steps more closely spaced. It is necessary for the skillful teacher to discover these tiny steps omitting none and finding out the way to lead her pupils carefully up the steps.

It is trite to observe that, if a boy or girl cannot learn from one method of approach, another should be used until the meaning or skill is mastered. It is helpful to multiply associations, suggest clues and remedies, such as the well-known jingle that has taught the number of days in each month to most of the country.

Spaced learning is important. Teaching for transfer must be planned since transfer is not automatic with slow pupils.

Drills are popular if well planned and interesting. There should be an emphasis upon accuracy and not upon speed, and different methods and materials should be used if the drill is planned to acquire skill or to maintain skill already acquired.

Within a class period there should be frequent changes of activity and type of thinking. Although bright pupils may concentrate with profit for a long period of time upon one interesting project, their less able brothers and sisters can seldom work for more than twenty minutes without some change. After intense application, the wise teacher lets the pupil's mind rest before beginning a new task.

It is fortunate for the slow pupil that visual aids have flooded modern classrooms, because the concrete path is his most favored route to abstract knowledge. Various kinds of multisensory aids are helpful but manipulative

materials are probably the most efficient; much can be learned from projected pictures if they add interest, explain meaning, or show methods to use in the topic being studied.

The United States is committed to a policy of educating through the secondary school all the children of all the people. It is of vital importance to the brighter pupils as well as to those of lesser ability that the education of the lower fifty per cent be given continued study and experiment to find out more about the capacities, interests, and needs of both groups of boys and girls.

C. MATHEMATICS FOR THE GIFTED

HOWARD F. FEHR

IN MOST European secondary schools (gymnasia) there is no problem of mathematics for the gifted pupil. The only mathematics presented is that for the abler pupils. In the United States of America, however, all pupils are eligible to enter secondary schools and, in many instances, to elect mathematics as a subject of study, whether or not they are capable of mastering the course presented to them. This permission has resulted in many small schools in a simplification of content until the gifted are no longer challenged. So in these cases the pupils of average ability study only a minimum number of courses, and the gifted, bored and dissatisfied, do likewise, selecting other areas of knowledge for their major interest. The alarming decline of students studying mathematics has been revealed in a study by Kenneth E. Brown, Specialist in Mathematics, Office of Education. [1]

This decline of study of mathematics by capable students has now reached the point where it threatens our national welfare. The Commission on Human Resources and Advanced Training [2] has indicated a present shortage of 20,000 scientists and engineers and an estimated shortage by 1960 of 60,000 scientific workers. The knowledge of advanced mathematics, both as a tool and as a mode of thinking is an absolute requirement for all these persons. Furthermore, the increase in technical positions, brought on by the increased use of scientific equipment in home and industry, demands a far greater output of average and slightly above average ability pupils who are well versed in elementary mathematics (including an introduction to the calculus). Thus for both our national security and our prosperity, it becomes an immediate task of the high school to develop the potential ability

[1] Brown, Kenneth E. "Mathematics, a Key to Manpower." *School Life*, November, 1953, p. 26.
[2] Wolfle, Dael. "Future Supply of Science and Mathematics Students." *The Mathematics Teacher*, Vol. XLVI, No. 4, April 1953, pp. 215-229.

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in mathematics learning among a larger number of pupils, to a greater extent that heretofore, in each of these individuals.

In order to develop the highest possible form of effective mathematics training, we need to consider first the manner in which students are to be selected for the study of mathematics. This involves *motivation* and *identification* of mathematics ability within the individual. Then we need to consider the *curriculum provisions* that will nourish and mature the ability, wherever it may be detected. In all these aspects, the *teacher's responsibility* and his relations to the gifted pupil are paramount. We shall consider separately each of these four aspects in providing for mathematics giftedness.

MOTIVATION

Creative activity is not a possession of the high IQ alone.[3] Frequently new suggestions, new ideas, and genuine curiosity are the product of minds with IQ's less than 135 or 140. The average and above average must all be given an opportunity to explore the mathematical field under the guidance of teachers who are thorough masters of their subject and able in presenting its concepts and values to young men and women. If a pupil is properly introduced to some mathematical ideas and modes of thinking and allowed to keep company with them, an alert teacher can soon see whether or not the union is compatible and capable of a long life of production. What has been missing in the past, in many classrooms, is an atmosphere and provision for exploring mathematics as a *way of thinking*—as a challenge to problem solving—in which the pupil can really discover whether or not he has ability in the subject.

In most reports on gifted children, the area of science and mathematics has been ignored, perhaps under the impression that these are tool subjects and not creative subjects. Gifted pupils have been encouraged to explore in painting, music, sculpture, writing, and so on. Such exploration should be continued, but at the same time, administrators and guidance counselors must come to know that mathematics is also a method of thinking that permits creative activity. To some pupils a challenge to discover how to solve equations (not to be told), to discover a geometric relationship, or to sense what is or is not a logical proof of a theorem is more inviting than to paint an impression of some experience. These pupils may be the future mathematicians of our society. But if given no opportunity, they may well turn their talents along other lines.

This opportunity for exploration of mathematical interest and ability should be initiated in the elementary school. However, most elementary-school teachers are not sufficiently versed in mathematics to choose and present

[3] Thurstone, L. L. *Creative Talent*. The Psychometric Laboratory, The University of Chicago, No. 61, December, 1950.

the proper material. So it becomes all the more important to do this at the beginning of and throughout the junior high-school period of study. At the end of the junior high-school study, sufficient data should be at hand to identify those with mathematics potential. Throughout the junior high-school period, while every attempt is made to locate good pupils in mathematics, no attempt should be made to force high academic students to be mathematics majors. We do not believe in proselyting or forcing interest. We recognize the need for gifted students in all areas of human activity.

IDENTIFICATION

The record of a pupil's past performance in the area of mathematics and his general intelligence quotient are not the only factors for identifying and selecting the gifted. Attitudes, interests, environment, social and personal adaptibility, drive, and powers of concentration can add or subtract from native endowment. Because of these many contributing factors, we must exercise several procedures in selecting pupils for special mathematics education. Beside the intelligence test we should use mathematics tests and teacher observation. The *Mathematics Attainment Test* and the mathematics section of the *Scholastic Aptitude Test* of the College Entrance Examination Board have proved very satisfactory in predicting mathematical power.

Identification, other than formal testing, calls for sound judgment on the part of the teacher as he observes and interviews the pupil. In the past, teachers have not succeeded too well in identifying these pupils for a number of reasons.[4] To aid teachers to make better judgments, the following traits with examples are presented. Many of these traits apply to other areas of study as well as to mathematics.

1. *An extraordinary memory*—Gifted pupils have a mental storage capacity that is amazing, and it is relational rather than rote memory. They recall facts and concepts learned years ago and practiced very little in the interim. *The gifted child seems never to forget.*

2. *High level abstract thinking*—Brilliant students make generalizations quickly and accurately. Roy, in the fifth grade, said: "I discovered that when you multiply fractions, the new denominator is the product of the given denominators, since to take a part of another part you must multiply to find the new number of parts in the whole." Note the generality (not particular fractions) and the abstraction of this discovery.

3. *Application of knowledge*—Creative students see mathematics in their environment and they are facile in the application and manipulation of mathematical concepts. An eighth-grade youngster, on a visit to a logging camp, re-marked a measuring tape, placing 1 at 3 1/7 ft. (or π), 2 at 6 2/7 ft. and dividing each of these segments into 100 equal parts. The reading on the tape when placed around a tree gave the diameter immediately. The boy changed the formula $C = \pi d$ to $C \div \pi = d$ and applied it to a very practical need.

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[4] Carroll, Herbert A. *Genius in the Making*. McGraw-Hill Book Co., New York, 1940, p. 6.

4. *Intellectual curiosity*—A talented student is speculative and answers his doubts by a logical procedure. A ninth-grade pupil, after learning how to use an ordinary slide rule, investigated the possibility of constructing a slide rule to the number base 5. He worked through the job of writing logarithms to the base 5, and actually made a slide rule to the base 5, perhaps the first one ever to be made to this base.

5. *Persistent goal-directed behavior*—Able children have the capacity for long and deep concentration on their problems. They do not give up, nor do they muddle through to a solution. They refine and polish their solutions until they are examples of concise thinking. This stick-to-itness is a rare trait and is readily recognized in those pupils who finally solve the most difficult exercises.

6. *Intuition*—The talented pupil has *insight* and the ability to penetrate, coming up with solutions in a manner that is frequently incomprehensible to teachers. How the pupil achieves this we do not know—perhaps through experience and outside reading and thinking, yet when it occurs, we should recognize it as a powerful predictor of future success.

7. *Facility of expression*—Ability in mathematics is almost always accompanied by high vocabulary and fluency of communication. Teachers can recognize this in class explanations and reports on assigned problems.

8. *Hobby interest*—The gifted pupil, at a given time, usually has a special interest on which he reads and works, and which he constantly relates to everything that goes on in class. Such interest must be recognized and encouraged. Examples are seen in the twenty-nine winners in the field of mathematics in the Search for Science Talent.

9. *Virtuosity*—The creative pupil gives every problem a *new* and more significant turn. He adds a more complex, more abstract connotation to a problem. If you cut a cone by a *plane,* you get the conic sections. The creative pupil says, "What do you get if you cut the cone by a parabolic cylinder, or more generally by any conical cylinder?" And the pupil who asked this question is an outstanding mathematician today.

10. *Advanced mathematical knowledge*—The mathematically gifted pupils have read and studied by themselves, and in class present solutions using far more mathematics than has been taught. Teachers must not deny the use of this advanced knowledge, but rather insist that it be used accurately and with correct understanding.

Teachers should train themselves to recognize these traits, by noting similar episodes in their own classes and keeping anecdotal records. In the long run it is the teacher-pupil relation that counts most in identifying and encouraging the gifted pupil in mathematics.

CURRICULUM PROVISIONS

Provision of effective education for the gifted pupil requires a consideration of a number of problems, among which the following are most important:

1. What is the best syllabus (mathematical content) for study by these pupils?

2. What changes in administration and classroom procedures are necessary, feasible, and acceptable to provide maximum opportunity for the intellectually gifted.

3. What textbooks, library reference books, and other materials for study must be made available to both teachers and pupils?

4. How do colleges and examining boards co-operate with the high school in testing, giving advanced credit, and preventing repetition of work accomplished in the high school?

Two notable experiments for school and college co-operation are now in operation.[5] These studies, while not as yet complete, have shown how to eliminate repetition in college of work completed in the high school. In addition, they have presented a revised curriculum in mathematics from the tenth year to the twelfth year. The significant changes appear to be (a) the elimination of solid geometry as a half-year subject, (b) condensation of treatments of complex numbers, determinants, logarithmic solutions of triangles, and the geometry of the circle, and (c) the addition of statistics and elementary notions of the calculus. The inclusion of these two topics is amply justified by the modern program of collegiate science.

Other significant proposals were made and reported[6] at a conference held in the U. S. Office of Education on the identification and provision for the student with potential in science and mathematics. However, many of these proposals call for extended work on the part of the teacher and frequently are applicable to only large school systems. But genius, creative ability, and power in mathematics is found in small towns, rural sections, and hamlets as well as in large urban areas. The following assumptions and proposals are realistic and possible in any secondary school, large or small. Of course, in a large city high school where segregation of the capable is possible, it has been found desirable, also, and is producing good results. In small high schools, the teacher must make the provision within the framework of her class.

One basic assumption underlying these proposals is: *There shall be no after-school teaching and no added extracurricular duties.* All teachers are expected to do some extra classroom curriculum duties, and it may well be that this duty of the teacher of superior pupils is with these pupils. But then she should have no other added duties.

Another basic assumption is that the *superior pupil must study all the mathematical disciplines of the regular college preparatory program;* he must not skip a subject. Of course, many of the traditional and non-essential topics will be omitted and in their place will be substituted modern approaches to mathematics. But mathematics is a structure which has sequence in its development. To omit necessary steps in the learning can cause delay and annoyance in later study.

Then how can we take care of the gifted students along with all the others in our classes? It can be done as a *problems course,* making use of the idea of a college seminar and the presentation of a thesis. In the regular class, under proper presentation of new material, the few gifted

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[5] *General Education in School and College.* Harvard University Press, Cambridge, 1952, pp. 52-56; *School and College Study for Admission with Advanced Standing.* Report of the Sub-Committee of Mathematics. Heinrich Brinkmann, Chairman. Swarthmore College, Pennsylvania, 1953.

[6] Brown, Kenneth E., and Johnson, Philip G. *Education for the Talented in Mathematics and Science.* Bulletin 1952, No. 15, U. S. Department of Health, Education, and Welfare.

students will need only two regular lessons during the week to learn the usual assignment. They can and should do all the regular assignments in one fifth the time it takes the other students. They can use the rest of the week for individual study and preparation on their selected problem(s). One day of the week should be given over to a seminar in which these pupils report on their study.

To be more specific, I shall cite several examples of the type of study that can be done. The student will *choose* an area of mathematics for individual work in which he has developed an interest and in which he will do independent study. He will consult the teacher on the selection of the particular area of study, the sources to which he will go, and the type of report he will make. In some cases this study will parallel the work taught in the course only at a more advanced level, consistent with the student's ability and probable future work. At other times it may be an area of study entirely apart from the course work, but of real challenge and of absorbing interest to the student. A library of reference textbooks is essential. (See suggested list at end of this article.)

In a ninth grade the topic of positive and negative numbers is usually taught first as a new number system. The gifted student could be directed to the study of the logical extension and development of number systems. He would be referred first to such texts as *Number, the Language of Science* by Dantzig, and *The Nature of Number* by Dubisch. Then he would refer to more technical books such as Klein's Volume I, *Elementary Mathematics from an Advanced Viewpoint,* Chapter I, and finally to a top-most book in difficulty, Hardy's *Pure Mathematics,* Chapter I. The student would organize all of this knowledge and present it in the seminar from time to time. He would write his thesis under the direction of the teacher, and, at its completion, he would be well started on a mathematical understanding and study of the foundations of analysis.

In a second course in algebra, a number of similar problems are open to the student. I would name the study of the theory of equations, the study of the conics, the study of functions, the study of limits and continuity. Each of these problems could well consume an entire half year or more of study. In the study of plane geometry, at least two principal avenues are open to a parallel problems course: one, the study of logical foundations or postulational methods; and two, a study of other types of geometry. A student who is interested in postulational methods would be referred to such texts as Hilbert's *Foundations of Geometry,* Wilder's *An Introduction to the Foundations of Mathematics,* and Cohen and Nagel's *Introduction to Logic and Scientific Thought.* They could also refer to such texts as Richardson's *Fundamentals of Mathematics* and Courant and Robbins' *What Is Mathematics?* A seminar report from time to time would

certainly be of value to the entire geometry class as well as to the few gifted students. Other more or less common and challenging problems are:

1. The complex and higher number systems
2. Vectors and their analysis
3. Statistical analysis
4. Boolean algebras (theory of groups or abstract algebra)
5. Symbolic logic
6. Co-ordinate systems
7. Logarithmic and exponential functions
8. Hyperbolic functions
9. Topology (an introduction, not the Mobus ring)
10. Differentiation
11. Integration, *etc.*

One word of caution is in order. These problems should be of a high mathematical nature and not of the curiosity nature so frequently found in the usual club presentations. Not that this latter procedure does not have a value for what it is intended, but that we must continuously keep in mind our objective for these gifted students. We need to challenge them to provide the highest type of mathematical thinking that will lead ultimately to fruitful scientific research. This means that we consult mathematical textbooks of high caliber and not recreational books.

A different kind of extracurricular activity, and one that is gaining real favor in New York City, is inter-school varsity competitive teams in mathematics. This should prove as challenging and as interesting as debating, theatrical, and other forms of arts competition. Each school allows the capable students to try out each month for the team. Each month the team of four (or five) is selected to compete with a team from another high school. A schedule for the year is drawn up in regular league form. The area of study, types of problems, and degree of difficulty are established beforehand, and the problems for competition are not known to the team or their coach until the meet begins. Individual and team honors are given. Such preparation is of great value to the individual when he seeks a scholarship through competitive examination.

However, neither of these competitive devices can exceed the use of the library, research seminar, and guided study. It is this genuine scholarly study that leads to interest, creativeness, and future production. *Creative ability can and must be developed by permitting creative activity.* This truism has application to all the teaching in the regular classroom as well as to assigned project work.

All of the foregoing presupposes, upon the part of the teacher, not only a good pupil relationship, but also a broad scholarly knowledge of mathematics. Some teachers now have this background. They can begin the program of educating the gifted. Other teachers have ability and they

can equip themselves to engage in this type of education. They should prepare themselves at once. Those remaining teachers who do not have the background will find many other problems with other pupils in which they can put their particular talents to work.

All proposals for educational programs are in vain if they do not result in some productive action. This action should be the joint initiative of teacher and administrator. It would seem in the present state of emergency that failure to take such action is a lapse of duty to our national welfare. We must educate our scientific and mathematical gifted pupils.

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D. MAINTENANCE OF INTEREST IN MATHEMATICS

WALTER H. CARNAHAN

EVERY time I hear someone say, "I am not interested in mathematics," I feel like saying, "You poor man. What did they do to you?" because it seems to me that interest in mathematics is as natural as growth. The child is born and reared in a world where things are counted, measured, and compared; he absorbs knowledge and skills in using numbers along with his knowledge and skill in using language of any other kind. I can understand

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how it can be that the processes of formal education introduce concepts in mathematics beyond the abilities of some persons to comprehend easily, but it is more difficult to understand what happens in the experience of any person that he loses all interest in quantitative relations and the language by which these are expressed and studied. As a matter of fact, I do not believe that this ever happens. He may lose interest in the mathematics that interests me and that I would like to be of interest to him, but I think some native interest remains in every person.

It may be that some person who reads this article has already said to himself, "Brother, you are talking straight at me. I have not had any interest in mathematics since they first told me to find *x*. My interest is dead, buried, and forgotten." All right, let us try a little experiment without any statistical manipulation such as averages or coefficients of correlation. I shall give you a little problem, and, just to make the whole thing painless, I shall give you the answer. This is the problem. John Smith has just been graduated from engineering school. He is offered two positions. Each pays $5,000 a year as a beginning salary. Job One offers an annual increase of $500, and Job Two offers a semiannual increase of $250. Which job is financially better? Answer: Job Two is better. Now, if you either accept or reject my answer without any attempt to apply reasoning to your acceptance or rejection, then you win the argument that your interest in mathematics is dead.

Having set forth my postulate that interest in mathematics is universal, I proceed to the discussion of ways and means of keeping this interest alive in pupils. I assume that the mathematics textbooks are well written and that the teacher has a good background of training and experience to present the subject well in the classroom. However, not always will these favorable conditions insure continuing interest on the part of pupils. One reason for this is that the interests of adolescents are continually broadening and even mathematics must take account of this fact. The broadening of their interests reaches out to history, to new applications, to the unusual, to biography, to further topics in the same subject, to sensory aids to learning, models, constructions, demonstrations, and social learning. Maintenance of the fullest possible interest in mathematics must take into account these broadening interests.

MEANS OF CULTIVATING THESE BROADENING INTERESTS

Every high-school library should contain books that present mathematics from the point of view of pure interest rather than from the point of view of logic or manipulation. I have gone into many schools where the library is properly stressed as equally as important as the cafeteria or the gymnasium and have asked to be shown the books on mathematics. Some schools have

one such book, a few have two, ten in a state may have five books on mathematics other than textbooks, and a very few schools have as many as ten. Most high-school libraries have none. Suppose that a pupil has heard or seen mention of theory of relativity, for example, and wishes to read a little on the subject. In many high schools he would find nothing whatever on the subject, unless it would be in an encyclopaedia which must give such treatment to the subject as the intelligent layman can read. Or suppose that he has heard the subject of topology mentioned and would like to know what is the nature of the subject; in many school libraries he would find nothing. What becomes of the budding interest of pupils who meet such discouragements? Obviously the interest dies or becomes dangerously dormant. As one of the essential conditions for maintenance of interest in mathematics, I would suggest a few well-selected books on mathematics other than textbooks.[1]

I mentioned social learning as one of the interests of adolescents. The term requires definition. I do not refer to the kind of social learning that goes on in classrooms, worthy and valuable as this is. I am thinking of the kind of social learning that takes place when one person with more than casual interest in mathematics comes in contact with another person with like interest. Reading together, discussing topics, solving problems, raising questions that have no present answer, and going together to some person for help are valuable social learning experiences on a high plane. I have met many groups and pairs of young men who have worked together in such learning experiences and have followed them up later to see what is the permanent effect of the experiences. Almost always the interest continues into college and often into professional experience. In many high schools there are pairs or groups of young persons with these interests. They should not be interfered with, but teachers should stand ready to give help whenever it is asked. The usual great need of these young persons is books and perhaps an opportunity to talk with specialists when they have formulated their questions. The specialist may well be a college professor of mathematics. The college thus should be regarded as a specific asset in maintenance of interest in mathematics.

A means of continuous interest stimulation in mathematics no less than in literature or history should be the bulletin board. Newspapers, magazines, trade publications, annual reports, advertisements, and other media of information and propaganda dissemination furnish unlimited material for bulletin board use. It is a simple matter to equip a bulletin board for display of a mathematics book opened to a page of special interest. Pupils can make models that can be displayed on the board. The teacher or the pupils can copy unusual problems and post these for the use of pupils. I know of

[1] See below chapter V, Section E. "Use of the Library" for a suggested bibliography.

one teacher who had difficulty with discipline during home-room period until she made a practice of putting up a new trick problem every day. No comment was made on the problem. The day I visited the school, pupils hurrried into the room at home-room period, turned to the right and copied off the current problem, then went to their seats and began work in groups of two and three. Not all pupils did this, but enough applied themselves to the problem that there was no disorder. Of course, the interest in mathematics was a temporary one for many of these pupils, but the interest of a few must have been permanently stimulated.

I have mentioned exhibits of models that can be mounted on the bulletin board. Exhibits constitute a very effective means of interest stimulation and can be either temporary or permanent if one has adequate facilities for their display. The most satisfactory arrangement is a built-in cabinet opening to the corridor. This makes it possible to show some of the attractive models to all pupils of the school. The exhibit may well be permanent, but the individual items in it should be changed from time to time to avoid the contempt that results from protected familiarity. If two or more such cabinets are available, variation can be had by the simple procedure of moving items from one cabinet to the other if new materials are not available. It is desirable to have a typed card with each item to call attention to its features, its connection with other similar models, its historical connections, its mathematical principles, and books that can be read for further information. Some items that make suitable units for such an exhibit are constructions of regular polygons, polygons in designs of linoleum or cloth, the Platonic solids, stellated polyhedrons, buttons showing geometric designs, mineral crystals showing geometric forms, sunflowers showing the logarithmic spiral, shells, the abacus, the quadratic slide rule, the logarithmic slide rule, mechanical angle trisectors, Peaucellier's cell, the quincunx, the brachistochrone, stitched curves, curves made by paper folding, geometric constructions done by paper folding, polygons made by tying knots in paper, a cone sectioned to show the curves, the Mobius band and its features, demonstrations of the color problem as it varies with different kinds of surfaces, the Klein bottle, magic squares, linkages, Napier's rods, tesseracts, and so on.

A specialized exhibit that is prepared in some schools has been called the mathematical Christmas tree. Usually this is an evergreen that is decorated with various kinds of mathematical models, plane and solid. Pupils can let their imaginations run riot in preparing for the tree. Some teachers make the branches of the tree by cutting right triangles of various sizes, attaching them to an upright, and painting them cedar green.

Many papers have been published concerning the advantages of mathematics clubs, so I shall simply mention them in passing and pay tribute to

their great effectiveness in maintaining interest. This interest reaches far beyond the membership of the club.

Up to this point this discussion of maintenance of interest in mathematics has been concerned with programs that are wholly local in nature. Let us now consider some programs that are wider in scope. Since many of these involve competition, it is necessary to consider the general effects of competitive programs, their benefits, and their undesirable effects. If it were not for the fact that we live in a democratic society, consideration of the effects of competition would be relatively simple. In a society that is concerned only with the most fortunate and the most able, one could enter into all kinds of competitive activities without much deliberation, I suppose, because one would be much interested in those who win and little interested in those who lose. In a democracy we must be concerned with the effects on the losers as well as the effects on the winners, and not only with the effects on contestants, but also the effects upon the whole program of interest maintenance.

In any program of contests it seems to me there are three classes of persons to be considered. *First,* there are the winners. Not always is the effect of winning good for the winner. Everyone knows of some person who once starred in some branch of athletics, for example, and then settled down in the shadow of his minor achievements for the remainder of his life. Fortunately not many winners do that. Once in a while a winner of a contest, even a contest in mathematics, thinks of himself as set apart from less able persons and suffers from his isolation. However, my observation is that the effect of winning is almost always good for the winner. *Second,* there are those who decline or are excluded from participation in contests. Perhaps they are not much handicapped by the effects of a competitive program unless teachers concentrate time and effort on those selected to compete and neglect non-participants. But if they are not handicapped by the program of competition, neither are they much benefitted. To the extent to which this is true the program of competition fails to achieve any useful effect in the way of general interest maintenance for this group. Still, there are other means of stimulating interest on the part of these persons which are in no way in conflict with the program of competition and its benefits for competitors. *Third,* there are those who compete and lose. Sometimes they are bitterly disappointed but as a rule they seem to feel that the competition conferred many and large benefits and that losing was an incident. They realize that they were traveling in fast company and were honored by the temporary association with persons of greater ability. On the whole, I am inclined to think that competition has more benefits than bad effects, always with the understanding that teachers, pupils, and school administrators keep clearly in mind the just balance of time and attention between competitors

and non-competitors, between programs of competition and programs of non-competition.

Let me discuss in some detail a program of interest stimulation on a state-wide basis that has no competitive features. I refer to a program in Indiana called the Sci-Math Assembly. From the beginning this program was designed as a means of stimulation of interest in mathematics and science on the part of high-school and elementary-school pupils. This program has always been free from all features of competition. There are no awards, no judging of exhibits, no prizes, no ribbons, no certificates of attendance. The purpose is to stimulate interest on as wide a basis as possible. Annually the invitation goes out from Purdue University for schools to come to the campus for a day and take part in a very unpretentious program. Pupils bring models and exhibits that they have made or collected, place these on tables in a large ballroom, look over items contributed by others, make acquaintance with pupils from other schools, visit points of interest about the campus, eat, and play. Purdue University statff members from the various departments of mathematics and science sit in conference with groups of pupils for an hour and discuss vocational possibilities of their subjects. In the afternoon there is a program of papers prepared by high-school pupils. A high-school pupil presides. No adult has ever appeared on this program except to welcome the pupils in the name of the University.

As one who has been actively associated with a number of professional organizations for forty-five years, I have sat through hundreds of programs and have listened to many hundreds of speeches and papers. No program that I have ever followed gives me quite the thrill of the program of speeches at the Sci-Math Assembly. That is not only because I realize that adolescents are giving the speeches, but also because they are intrinisically interesting and good. Lest the reader think that these speeches are given by highly selected individuals, let me hasten to say that any pupil in any high school in Indiana can get on the program as speaker in 1955 by simply asking to be put on and agreeing to read and make serious preparation. The reason for specifying 1955 as the first opportunity is because mathematics speakers for 1954 are already listed and one speaker for 1955 is already working. All of these are on the program on their own or their teacher's solicitation. I have met none of them, but I feel sure that they will make good. From a modest beginning with 350 pupils in 1950, the Assembly in 1953 saw 1,200 in attendance. This is hardly the place to give details of organization and preparation for the annual event, but it should be said that they are not burdensome, even to us who sponsor the event. We claim no credit for priority in such a program. Other states had such programs before Indiana got under way.

There are a number of programs of interest stimulation that involve competition. This is the thirty-ninth year of the High School Achievement Program in Indiana, and I assume that many states have similar programs so that a brief description of the Indiana program may serve to give an idea of what such programs are in whatever state or section they are organized. The Indiana program involves English, Latin, and mathematics. At other times there are or have been similar contests in commercial subjects and in music. I shall give a brief outline of the program for mathematics. The contests involve examinations, and no other factor is considered in naming winners. There are regional examinations and then state examinations for which regional winners are eligible. Examinations are in elementary algebra, plane geometry, and a comprehensive mathematics examination for juniors and seniors in the high schools. Suitable restrictions as to subject matter for the various contests are agreed on ahead of time so that teachers know in what areas emphasis should be placed. For winning in a regional contest, there is no award except a certificate and the satisfaction of winning. Winners in the state contests receive gold medals, those in the next highest group receive silver medals, and those in the third group receive bronze medals. Other participants receive suitable certificates. The burden of organizing the contests has always been borne by Indiana University.

This is the thirteenth year of the Science Talent Search program conducted by Science Clubs of America. This is a national program which has been widely publicized and has conferred many benefits, some of these material. The competition includes mathematics as one of the sciences. Talent Search is definitely organized to find and to encourage young students who have exceptional ability in the sciences. Most of the material awards are in the form of scholarships for study in colleges and universities. A contestant does not have to win a national honor to receive a valuable award. Last year in one state alone the amount of $57,000 was given in scholarships to pupils who participated in the contest.

It is probably true that no professional scientist, technologist, or mathematician ever chose his profession with a background of dislike or even neutrality toward mathematics. There must be a continuous interest in the subject for success in any of these fields. This being the case, it becomes necessary for us to do everything possible to maintain interest in mathematics on the part of capable persons. I do not mean that this interest should necessarily exceed interest in science or in history or English, but I do mean that it should be no less than interest in those subjects. We as teachers of the subject and administrators of schools should use every available means to maintain this interest.

Chapter V.

Methods, Materials, and Setting for Effective Teaching

A. CREATIVE TEACHING IN MATHEMATICS

H. C. CHRISTOFFERSON

OUR scientific age with its emphasis on machines and brains rather than on manual labor and brute strength places an ever-increasing emphasis on the need for mathematics. The age of *The Man with the Hoe* is gone and in its place has come the age of the man with a pencil to record data so as to control the machine. The man or woman with the machine needs tables, graphs, charts, and much understanding of mathematical relationships to enable him or her so to adjust and so to use these mechanical devices that the work of the world will be well done. Twenty years ago when one bought a car one had to drive it at a low rate of speed for 500 to 1,000 miles. Now all parts are machined with so much greater mathematical accuracy, tolerances are figured so much more closely, that these breaking-in periods are largely eliminated. This illustrates the fact that workmen need understandings and insights in mathematics even more than computational skills, and increasingly so as our society becomes more and more scientific. It is because of this great and increasing mathematical need of youth that "creative teaching" has a timely emphasis.

In order that words may not have unintended meanings, as well as to illustrate a mathematician's insistence upon clear-cut definitions, it is essential that we first agree on the implications of the term "creative teaching." Educators love new terms and slogans. The current emphasis on "creative teaching" and on "an experience curriculum" is like the car dealer's emphasis on power steering and power brakes, since automatic transmission is no longer the latest feature. Unlike power steering, however, creative teaching is not a device, not a gadget, not even new really; it is basically a whole philosophy of teaching, in fact, the entire steering structure which gives direction and life to what the teacher does. The following are aspects of the technique.

First, pupils must discover many ideas without being told. That is, the teacher so sets the stage and so directs the thinking of the group that many

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pupils have the joy of discovery and the satisfaction of insight into the nature of a new process or technique. Telling is not teaching, in this sense. The teacher becomes the skillful guide to assist the pupil in exploring new ideas, in experimenting with concepts, and in deriving his own rules and conclusions to be later refined and completed under the guidance of the teacher.

Second, a pupil cannot discover the meaning of a new word or other symbol, even though the new term is not formally or rigorously defined. For example, one does not discover what the fraction $\frac{1}{2}$ means. He must be told that, by illustrations from various concrete or semi-concrete settings, but he can discover that $\frac{1}{2} = \frac{2}{4} = \frac{4}{8}$ and that, if both terms of a fraction are multiplied by the same number, the resulting fraction still equals the original. One does not discover what per cent means, but after learning that per cent is a fraction and really means hundredths, he can discover how to use it. In other words, successful use of creative teaching depends on discrimination concerning what is to be created or discovered. A pupil does not discover a whole number system, nor will he be expected in a few months or years to discover his entire social heritage. Therefore, to avoid giving the kiss of death to this new yet old idea, the items or ideas to be discovered must be selected with discretion.

Third, creative teaching usually uses pupil experiences. That is, the new process to be learned often emerges from actual social setting or from a readily imagined social setting or is an extension of previous meaningful experiences. Mathematical processes seem most readily taught creatively when they seem to emerge from real or imagined social settings which are within the experience of the pupil and are fully understood by him.

Fourth, pupils must be active participants mentally, and are often active physically as well, because of their eagerness and joy in discovery. Creative teaching is not a lecture method. Teachers must put their power brakes on lecturing, on telling, on helping too soon. The pupil will learn better, retain longer, and use more effectively information and techniques in the learning of which he has done some pioneer struggling in discovery.

Other names for this philosophy of teaching have essentially the same meaning. Mursell's[1] phrase, "Developmental Teaching," bears the same connotation. Creative seems a better word than developmental. Discovery teaching is used by some present-day writers with much the same thought behind it. "Heuristic teaching" was used by Schultze[2] and others in the early 1900's. Heuristic comes from the Greek word to discover. But semantics and former use with a somewhat different meaning made that term unsatisfactory. Many writers during the 1930's and 1940's have used in-

[1] Mursell, James L., *Developmental Teaching*, McGraw-Hill Book Company, 1949.
[2] Schultze, Arthur, *The Teaching of Mathematics in Secondary Schools*, Macmillan Co., 1914, 1927 Revised.

ductive as synonymous with our use of creative, but a lecture can be inductive; so again philology cripples the idea and interfers with its application. "Creative" seems the best word yet used for an old and tried philosophy with new settings and new implications.

Just as a modern automobile still rolls on wheels even though it has many new features, so modern teaching must get power, drive, and effectiveness from the interest, energy, and enthusiasm engendered by pupil discovery, by pupil pioneering, by pupil participation, even though there may be new words, new color, new enthusiasms. Interest, drive, motivation, enthusiasm, insight are the old ideas upon which good teaching depends as an automobile depends upon wheels. Creative teaching is the new and comprehensive setting for modern and more perfect functioning.

The following illustrations will help the reader further to discover what is meant by creative teaching and thereby assist the writer to present "creatively" the idea involved.

Miss Reed was teaching numbers to first graders. They had learned to count and most of them could count to thirty. Children must be told what four means or that the figure 4 is the same as the word four, but they can discover that $2 + 2 = 4$. They had learned to count many sorts of things in the classroom, including four sheep pictured in the pasture and the five sheep outside. Then Miss Reed said, "Now let's see how many sheep there are altogether." You will recognize here a readiness program leading on to addition. A little hand went up and Johnnie said, "There are nine altogether." Miss Reed then asked, "How did you know that, Johnnie? You did not count them." Johnny replied, "Well, five and five are ten; so five and four must be one less than ten."

Such a response should make any teacher very happy. Johnnie had discovered the relationship between $5 + 4$ and $5 + 5$ and had acquired an insight into number that no amount of telling could possibly equal. Here is a simple and small example of allowing a pupil to discover, of setting the stage so as to encourage him to create an idea new to him, and thereby to give him an insight which the mere memorizing of the fact, $5 + 4 = 9$, leaves completely lacking.

Since space is limited and my readers will be largely high-school teachers and executives, I'll omit illustrations from grades 3, 4, 5, and 6 in which creative teaching can be so effectively used for teaching such fascinating items as basic facts, carrying, borrowing, adding or subtracting fractions, multiplication and division of fractions—both common and decimal. These are the most important grades in our schools. Good teaching here, in my opinion, has more enduring rewards than at any level from kindergarten to graduate degrees. However, I cannot jump this area without quoting a

fitting statement by C. L. Thiele[3] of Detroit in the *Fiftieth Yearbook (1951) of the National Society for the Study of Education.* "Teachers are no longer satisfied with . . . a method of repetition. . . . They strive to guide and direct the learning experiences of children in such a manner that thinking dominates the learning process. They seek active pupil participation rather than passive acceptance in the acquisition of the concepts, skills and abilities of arithmetic."

Mr. Schluter teaches in a junior high school. The following lesson on percentage might well have occurred in a seventh grade taught by him.

MR. S.: "In last night's paper there was a big advertisement headed, '10% REDUCTION ON THE FOLLOWING ITEMS FOR PRE-INVENTORY SALE.' Some of you may know what that means, but for most of us per cent is a new idea." He then let several students give their ideas about 10% of the cost of a blanket that sold normally for $12.75. Finally, he concluded this introduction with the following statement:

"To keep clear about per cents, one must know that per cent is a fraction and that it means hundredths. Whenever you use the word per cent, you may substitute hundredths and have it in working form. Per cent is easier to say. It is the businessman's language, the polite dressed-up form; hundredths is the man in working clothes. Now what does 10% of $12.75 mean?"

DEAN: "10% of 12.75 means 10/100 of $12.75 or 1/10 of $12.75."

MR. S.: "Write it on the board, will you please, Dean? In what other way could Dean have written 10 hundredths?"

SUE: ".10 of $12.75 or $12.75
x .10
———
$1.275 or $1.28"

This she wrote on the board.

MR. S.: "Very well. Dean and Sue got the same answer apparently. Does that mean now that the blankets will sell for $1.28?"

JOHN: "No, that would be giving them away almost. The ad said 10% off, so you take the $1.28 off the $12.75 to find the cost. Then $11.47 is the cost to us."

MR. S.: "Suppose it had said 12% off or some less simple number than 10%. How would you work it then?"

SUE: "I should think you would take .12 x $12.75."

MR. S.: "Where did you get that .12 from?"

SUE: "From the 12%."

MR. S.: "From this can you derive a rule for changing per cents to common or decimal fractions?"

This was done and additional applications made to fix the idea. Enough of this to show the contrast between the common practice of giving the rule first then drilling on it, and this more democratic method of so directing the students' thinking that they will discover the rule or process for themselves. There can be little argument concerning the interest of the students and the completeness of their insight into the intricacies of beginning per cents.

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[3] Thiele, C. L., *The Fiftieth Yearbook of the National Society for the Study of Education*, Part II, "The Teaching of Arithmetic." University of Chicago Press, 1951, p. 77.

From the ninth grade, I select an algebra lesson taught by a student teacher who believed in meaningful teaching before it was known as creative teaching. Urban Vaccarillo was our star center on the football team and the lesson he taught was not found in books, nor did the process emerge from a social setting. Sometimes the concrete setting interferes with thinking, and success is more assured at the abstract level. Urban began about as follows.

MR. V.: "You have done very well with adding and substracting these new numbers that we learn about in algebra. Multiplying is the easiest of all to do by rule, but it is not so easy to understand why the rule works. I shall write down two series of numbers to be multiplied and I want you to figure out the answers. Here they are."

+3	+3	+3	+3	+3	+3	+3	
+3	+2	+1	0	—1	—2	—3	*etc.*
+9	+6	+3	0				

+3	+2	+1	0	—1	—2	—3	
—3	—3	—3	—3	—3	—3	—3	*etc.*
—9	—6	—3	0				

In the first row when they got to +3 by —1 they hesitated a minute, but soon all agreed that the answer had to be —3, and the next ones —6 and —9. In the second row as the multiplicand grew smaller, finally became zero, and then negative the arguments were strong; but all agreed that for the system to work, for the series to be unbroken, (—1) by (—3) must be +3, perhaps largely because it could not be —3, and the last two +6 and +9.

Urban then had them state the rule which finally was refined to, "The product of two quantities with like signs is positive and the product of two quantities with unlike signs is negative."

There may be better ways of teaching these principles of dealing with directed numbers, but Urban did creative teaching before that new phrase was invented as many other successful teachers have done for years. Unfortunately, too many teachers would give the rule first, have the students repeat it and apply it and they call that teaching. There is a difference, and high-school principals should be the leaders to recognize and reward that difference.

In a tenth-grade class Mrs. Walters was ready to begin work with an isosceles triangle. She did not begin by using the new word but by speaking of a triangle with two sides equal. To show such a triangle she used three little balls of art clay for vertices and three sticks for the sides. Two of these sticks were equal in length, to make an isosceles triangle.

MRS. W.: "I have here now a triangle with two sides equal. Let us think about this figure to see what we can discover about it. We have studied about equilateral triangles and we know what right triangles are. This triangle also has a fancy name. It is called an isosceles triangle. Whenever a triangle has two sides equal it is called an isosceles triangle. *(Wrote isosceles on the board.)* Suppose we connect the vertex which is between the equal sides with the mid point of the base. What is such a line called, Alfred?"

ALFRED: "A median."

MRS. W.: "What seems to be true here?"

MARY: "The median seems to be perpendicular to the base."

MRS. W.: "A very good observation, but before we investigate that, let's find some other conclusion, too."

GEORGE: "Well, that angle seems to be bisected. It is bisected because the triangles can be proved congruent." *(George had unusual insight and seemed to grow in self-confidence as he proceeded to prove the triangles congruent and consequently that the angles were equal.)*

MRS. W.: "George, since you did this so well, suppose you give us your conclusion as a well-worded sentence. George's first attempt went something like this. 'When a triangle has two equal sides, the median to the third side bisects the angle between the equal sides.' "

MRS. W.: "Do you feel that this would always be true of any isosceles triangle, or is it true only for this one made of wood and clay?" *(This was discussed with the suggestion that "any" isoceles triangle could be drawn on the board and the same proof would hold for it. Then an improved and shorter conclusion was given using the word isosceles.)*

MRS. W.: "Now let's examine Mary's idea about the median being perpendicular to the base. How can we prove two lines perpendicular? We have never done anything like that before." *(They had been too well trained in geometric thinking and deductive proof to suggest laying a square piece of paper on it to check. Finally, Mrs. W. asked the following question.)* "What does perpendicular mean, Anne?"

ANN: "Lines are perpendicular if they form a right angle or two right angles, or maybe four right angles, if they go clear through."

MRS. W.: "Look at this figure with the two angles that Mary thought must be right angles and maybe you will get an idea." *(She held up the model for all to see clearly. Several hands were up and eyes got bright, but George could not hold his idea so he burst forth.)* "Well, those two angles are equal and their sum is 180°, so each must be 90°."

Enough from this lesson to show the difference between the usual technique of reading a theorem in the book, reading the proof, perhaps memorizing it, and then next day repeating the thinking of the author, and this development used by Mrs. Walters in which the students not only discovered the proof, but also even invented the theorem itself from their experimental model. Needless to say, these students were getting the sort of experience with thinking in terms of mathematics that will make that mathematics function. Such experiences are not only interesting and provide dynamic motivation, and are almost unforgetable, but also they provide that insight into skills and knowledge that is so vital for our machine age. Furthermore,

the influence on the life and personality of the child in developing self-confidence is immeasurably great.

Perhaps these illustrations are enough to give a label to the sort of teaching which is advocated by many teachers of mathematics. The technique is not new. Any reader will recall teachers who have used it and many readers will recognize in it their own philosophy, or they may be given courage to enlarge upon their own ideas. For teachers who are in a hurry "to cover the ground" it may seem slow. But for teachers whose chief aim is "to uncover the ground," it is very rewarding in pupil interest, in pupil personality, and in acquiring those mathematical insights which will more surely function adequately in this age of science.

B. BUILDING MATHEMATICAL CONCEPTS LEADS THE WAY (For Teaching Mathematics in the Elementary School)

MARGUERITE BRYDEGAARD

THERE are approximately seven hundred thousand teachers of mathematics in the United States of America. And, there are innumerable varieties of methods for teaching mathematics used by these teachers! However, in the vast storehouse of procedures, some newer ideas and practices are taking root. In this article, a few trends and some recommendations for steps ahead in teaching mathematics in the elementary school will be discussed.

SOME TRENDS IN TEACHING

One of the most significant trends of the last fifty years is that of a changing concept of the nature of the learning process. Great strides are being made toward sensing the inadequacy of a program based on telling pupils "what to turn upside down," "what to cross out," "which way to count decimal places," *ad infinitum*. The age of "tell-and-do" is being replaced by the concept of personal understanding based on meanings. Children's interests, needs, experiences, and readiness for learning are analyzed and considered in a program based on meanings.

The procedure through which this high level of meaning develops is that of challenging the pupil to sense, experiment, invent, discover, test, verify, and apply basic concepts of mathematics. This experiencing is a "laboratory for learning" procedure as contrasted with a "recitation-hearing" procedure. A learning-laboratory procedure does not imply an age of gadgets! A classroom becomes a learning-laboratory when experimentation and discovery of ideas leads to the formulation of procedures and concepts based upon

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sufficient and reliable information. Materials for the laboratory consist largely of things that children and teachers bring into a classroom for specific lessons. Bottles, cups, glasses, jars, cartons, labels, boxes, cans, string, counters, measuring sticks and innumerable other materials should be a part of a mathematics classroom.[1]

The trend of changing instructional procedure from "recitation-hearing" to that of "learning-laboratory" is being combined with keen analysis of number facts and skills geared to fit the needs of pupils. This fine combination leads to pupil achievement of numerical computation with greater skill and less drill.

Few people question the need for repetitive materials to develop mastery of number facts and skills. With all repetitive material the underlying purpose is to clarify, to refine, to promote application, and to insure mastery of what is learned. Well-planned drill needs to be based upon specific things and to be taught and developed to fit the needs of the specific things and the needs of the given group of learners. It is usually true that drill materials can be substantially reduced when they are preceded by the specific concepts that underlie them and when sound methods for achieving mastery are developed.

Another significant trend has been broadening the meaning of the term *arithmetic*. To facilitate the movement, it has been recommended that the term "mathematics in the elementary school" supplant the term "arithmetic."[2] In the past, too often the term arithmetic has been considered synonymous with number work. If a pupil memorized number facts and developed rules and skills with numerical computation, it was assumed that he was equipped to apply his skill. Research studies and observation of the product of a program based on this idea reveal its inadequacy. Today, there is general acceptance of the idea that mathematics in the elementary school includes concepts with regard for basic quantitative relationships. Size, order, number, and form are characteristics which are constantly being observed. Ideas of how large, how small, when, where, how many, how much, *etc.*, are a basic part of the program.

The identification, classification, and development of procedures for teaching the basic concepts that underlie mathematics in the elementary school are some of the most important trends of the last three decades. For example, key concepts of the decimal system of notation are basic for understanding of numerical computation with whole numbers. The concepts of the constant value of the ten primary digits, of the positional value of the

[1] Development of the learning-laboratory approach is the main theme developed by the National Society for the Study of Education in its Forty-Ninth Yearbook, Part I, *Learning and Instruction*. It is stressed in its Fiftieth Yearbook, Part II, *The Teaching of Arithmetic*.

[2] Sueltz, Ben A., "Measuring the Newer Aspects of Functional Arithmetic," *Elementary School Journal*, 47: 330, February, 1947.

Spencer, Peter Lincoln, and Brydegaard, Marguerite, *Building Mathemathical Concepts in the Elementary School*, New York: Henry Holt and Company, 1952.

And others.

digits in number symbols, and of the functions of zero are among ideas basic for interpretation and understanding of all work with whole numbers. The key concepts can be identified for each specific topic for mathematics in the elementary school. When pupils understand the key concepts, they are released to apply mathematics in all areas of experiencing.

As the two trends of change of instructional procedure and development of understanding of mathematics take root, they lead to the following advances in mathematical learning in the elementary school:

1. Greater understanding of basic quantitative relationships
2. Greater appreciation and application of the basic ideas of mathematics in the elementary school
3. Increased efficiency in terms of mastery of numerical computation
4. The development of problem solving that centers around mathematical relationships and children's activities and spheres of interest
5. Greater efficiency in solving problems
6. Less drill and more skill through a program based on concept building and personal understanding.

SOME NEEDED STEPS AHEAD

There are many needs for steps ahead. The three listed below are among the most significant ones.

1. One of the greatest needs for progress in the field of mathematics in the elementary school is to challenge teachers to develop their own understanding. As stated by Fred J. Weaver, ". . . the extent to which meaningful arithmetic instruction becomes a reality for children is directly proportional to the extent to which arithmetic is meaningful to the classroom teacher herself. It is an impossibility for teachers to emphasize and direct attention to the development of meanings which they themselves do not understand, or of which they are not cognizant."[3] The movements ahead in teacher-education courses coupled with the in-service program will lead to better teaching. In these programs, there is need for precise and intelligent development of the following things:

a. To equip students in teacher education and teachers in-service to formulate understandings that lead them to think of mathematics as one of the most delightful and meaty subjects of the elementary-school curriculum. Attitudes are contagious. If the teacher truly enjoys a subject, he can challenge his pupils to enjoy it if his knowledge of the subject is accompanied with the art of teaching. Teacher understanding, application, and appreciation lead to creative thinking and creative teaching that lies in the opposite direction from developing "a bag of tricks with number."

b. To equip teachers through having them identify, classify, and develop good procedures for teaching the basic concepts that underlie mathematics in the elementary school.

c. To equip teachers to identify, classify, and develop procedures for teaching the numerical computation that should grow out of the basic concepts.

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[3] Weaver, Fred J., "A Crucial Aspect of Meaningful Arithmetic Instruction," *The Mathematics Teacher*, 43:112, March, 1950.

d. To equip teachers to understand mathematics in the elementary school as systems of concepts with regard for quantity so that the total pattern of concepts dictates the development of each specific unit of numerical computation.

e. To free teachers to grow continuously in their understanding of the nature of learning, of the basic principles of good teaching, and of mathematics.

2. There is real need for more extensive research that is based on a program of concept building. Many of the research studies of the past years have been based on a drill theory, and the conclusion should be questioned in terms of a program based on concept building. These studies should include topics such as the following:

a. What kind of drill is needed to teach specific units of instruction?

b. How much drill and how many examples are needed to teach a specific unit of instruction?

c. When and how to begin the formal teaching of mathematics in the elementary school?

d. What degree of mastery of concepts and skills is desirable and logical?

3. Better teaching materials which include textbooks, workbooks, films, laboratory materials, and instructional guides for teachers should be developed on the basis of research and through interpretation of mathematics as systems of concepts with regard for quantity.

4. Evaluation of the curriculum and of courses of study should be a continuous process.

5. There is need for better evaluation of the learning of mathematics in the elementary school. Tests are valuable instruments for measurement and evaluation of pupil progress. The area a test measures is of necessity a limited one. The value of any test depends upon what it measures, how well the measurement fits the pupil, and how intelligently the teacher interprets the test and the pupil being tested. There is need to develop standardized tests that do a better job of measuring understanding of specific concepts, generalizations, skill in applying ideas, and interpretation of numerical computation. Many tests of so-called problem solving are largely glorified numerical computational exercises.

Teacher judgment and teacher-made tests are a very important part of the program for evaluation. Evaluation should include the ability to sense, express, and apply basic relationships of mathematics, the degree of intellectual curiosity, the development of good procedures for problem solving, and skill in achieving facile, accurate work with numerical computation.

CONCLUDING STATEMENTS

The trends toward better teaching are taking root, and newer research studies will grow out of the trends. Knowledge, resourcefulness, and liberation that comes through understanding point the way to the development of a sound foundation of mathematical understanding.

The sound foundation of mathematics in the elementary school prevents the toppling effects that often occur in programs in junior and senior high school when teachers and pupils attempt to construct super-structures on unsound foundations. At each educational level, the first step toward mathematical competency and liberation is that of building concepts. This is true for teacher education and in-service teacher programs just as truly as for programs of the elementary schools and secondary schools.

C. USING CONCRETE MATERIALS AS TEACHING AIDS

EMIL J. BERGER

"MAKE mathematics meaningful" is an admonition which teachers of mathematics have heard over and over many times. What does it mean? The answer is not clear. In all probability, it means different things to different people. To the educator, who looks upon mathematical training as one phase of the total program which schools undertake to provide for pupils, it means a vitalization of the usual course offerings with more emphasis on applications and a fuller consideration of the social implications of the subject. To the school administrator, it means organizing courses in such a way that their requirements will be sufficiently attractive, interesting, and flexible to meet the needs of both the average and the gifted pupil. To the teacher of college mathematics, it means more integration of the fundamental topics of basic mathematics and more emphasis on analysis. To the parent, it means an opportunity for his children to understand the methods and applications of a subject with which he may have had difficulty or did not have the opportunity to pursue beyond the eighth grade.

Do all these thoughts constitute the same requirement with respect to the task of making mathematics meaningful? Not entirely, but the ideas inherent in them are not as contradictory as one might suppose. The teacher who has accepted the challenge of meeting the demands implied by these ideas has, by initiating certain adjustments in his methods, been able to make some progress toward satisfying certain aspects of all of them. The statement that "Mathematics teachers tend to teach as they were taught" is rapidly becoming a misstatement. It is because of this thought that an effort has been made in this article to present a careful but brief resumé of one of the most popular practices that accompanies efforts to improve mathematics instruction today, namely, the use of concrete materials as teaching aids. This has been attempted in a manner that is fully expository, but only slightly technical.

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The use of concrete materials by mathematics teachers is no longer novel. Multi-sensory aids, as these aids are commonly called, has become a household expression in the field of mathematics education; and the nature of the materials being used indicates clearly that it has been the mathematics teacher himself who has assumed the initiative for developing and collecting them. While this self-instituted movement by mathematics teachers has been gaining momentum for more than two decades, there is still only a limited selection of such learning aids available from scientific companies if one excludes drawing and measuring instruments. Supply houses have been slow to enter the field of production because of the difficulties involved in standardizing equipment which individual teachers and their pupils have designed to meet their particular needs. Also teachers are not agreed on what such standardization should be. Even so, ideas for learning aids have multiplied, and the practice of using concrete materials in the mathematics classroom is firmly rooted far and wide. It is an active effort, a growing effort, and an exceedingly healthy effort because the teacher and his pupils are at the hub of it.

Despite these encouraging facts, the use of concrete materials in the mathematics classroom is still somewhat of an undefined technique; so it is difficult to list materials and describe procedures of usage that all teachers of mathematics will consider typical. However, as a simple expedient for introducing some order in this discussion we have attempted both. The kinds of concrete materials we have in mind are, for the most part, home-made devices produced by the teacher or pupil, objects which may be readily collected and adapted for purposes of illustration, and a few commercially-produced devices including measuring and drawing instruments. With respect to procedures of usage we propose the following classification: (1) Demonstration aids, (2) Developmental aids, (3) Analysis aids; (4) Projects, and (5) Measuring and drawing instruments. Needless to say, this classification is somewhat arbitrary, but it has been adopted at this point because it helps clarify the discussion of certain practices that seem to be evolving in the field of mathematics education.

DEMONSTRATION AIDS

Demonstration aids are what one would expect: models, mock-ups, dynamic devices (those with movable and adjustable parts), simple mechanical tools, common household objects, and even an occasional piece of discarded junk. Undoubtedly the reader is familiar with the usual array of geometric solids, the demonstration slide rule, and the blackboard graph chart that can be found in even the most modestly equipped mathematics classroom. However, in the classroom of 1954, these are only a beginning of the things that can be found if the teacher has had the time, raw materials, and

workroom facilities to design original devices, and the storage space to collect mathematically suggestive looking objects. To mention a few there may be such things as a carpenter's square with which to demonstrate methods of bisecting and trisecting angles, a folding porch gate with which to illustrate properties of parallel lines, a machinist's centering head with which to illustrate everyday applications of plane geometry theorems that have to do with tangents to a circle, or there might possibly be a discarded automobile headlamp re-equipped with a movable light bulb for demonstrating the properties of a parabolic surface. Other objects that one could expect to find are an embroidery hoop to help the teacher with the problem of giving meaning to the ratio $C/d = \pi$, a tailor's tape with which to give meaning to the concept of perimeter, a jello mold (with an open center) to serve as a model for explaining a method of finding the area of a circular sidewalk around a pool, a mason's chalk line for demonstrating the concept that two points determine a straight line, a strawberry box to serve as a model of a frustum of a pyramid, sets of measuring spoons and measuring cups to help the teacher communicate the concept of "commensurable unit," illustrations of similar figures such as snapshots and enlargements, and a host of other objects that may be obtained from the kitchen cupboard or basement shop. Illustrations like the foregoing, of easily obtainable concrete materials and their uses, are legion, and the extent of any collection of such objects is limited only by imagination and the time one can give to it. Some teachers have literally hundreds of such "tricks of the trade" up their sleeves, and they are increasing their collections daily by exchanging ideas with fellow teachers much in the manner that housewives exchange successful cake recipes.

Not all demonstration materials are quite so simple nor as easily acquired as those enumerated above. Many of the kinds of demonstration devices used in the mathematics classrooms of today are home-made—either pupil-made or teacher-made. This is true partially because desirable objects cannot always be found, partially because the selection of commercial devices is extremely limited, but, in the main, because performing demonstrations with concrete materials is somewhat of a pioneering idea when it comes to the development of mathematical topics. Efforts at demonstrating concepts depend in large measure on the ingenuity and imagination of the teacher.

Several typical devices of the kind under discussion include a centroid demonstrator, an incenter demonstrator, a Galton board, and a device for weighing beyond the capacity of a scale. The first of these is a variable device in which the medians are represented by rubber binders, it may be used to illustrate that the center of gravity (centroid) of any triangle is the point of concurrency of the medians (Figure 1). The second of these may be used to demonstrate that the bisectors of the angles of any triangle are concurrent no matter what shape of triangle is considered (Figure 2). The

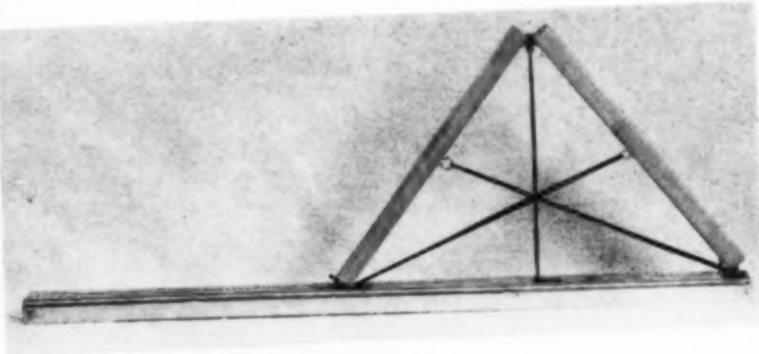

FIGURE 1.

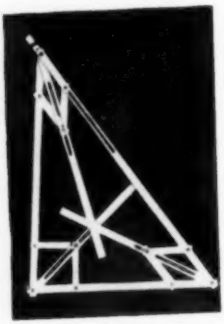

FIGURE 2.

FIGURE 3.

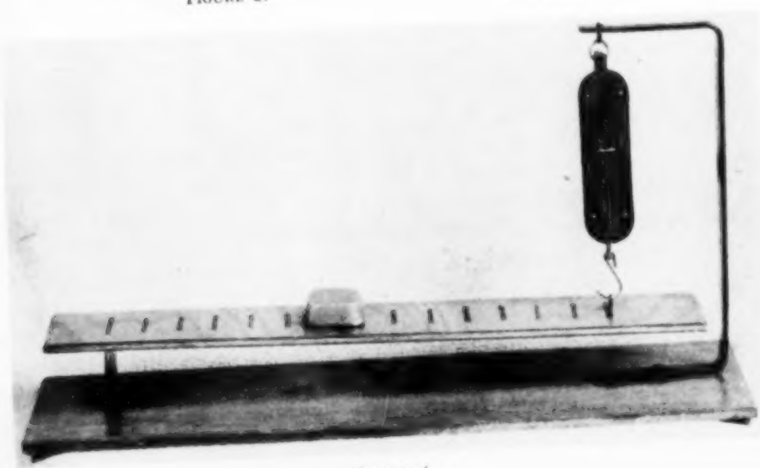

FIGURE 4.

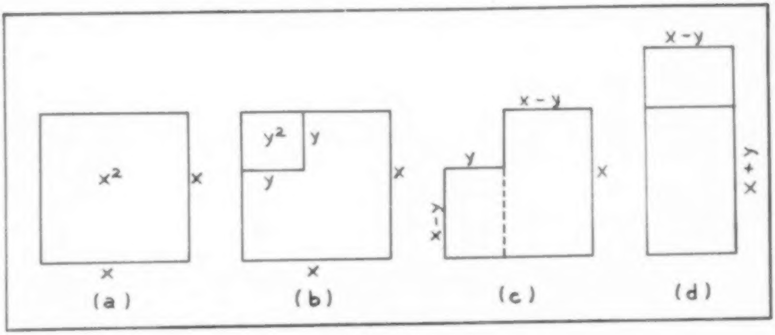

FIGURE 5.

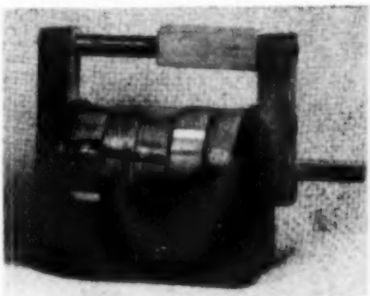

FIGURE 6.

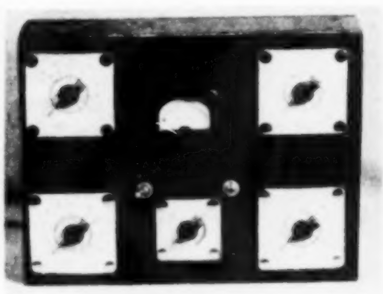

FIGURE 7.

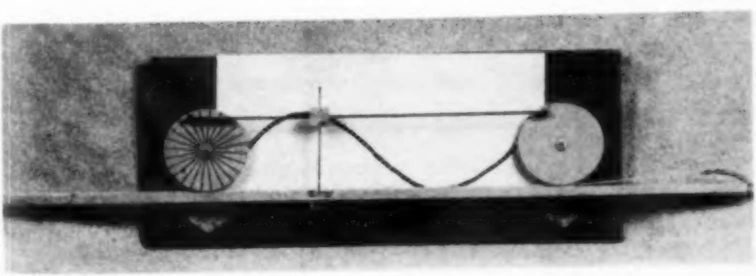

FIGURE 8.

Galton board, illustrated in Figure 3, is a contrivance made of plywood and one inch hexagonal bathroom tiles and may be used to demonstrate what is meant by the "normal" curve. Finally the device for weighing beyond the capacity of a scale is a concrete representation of a physical problem which solution calls for the development of a suitable algebraic equation (Figure 4). All four of the devices pictured are pupil-produced.[1] They are representative of the kinds of home-made devices that teachers the country over are beginning to use in the mathematics classroom.

If developing such devices is a difficult task for the teacher, helping pupils build their own devices and teaching how to perform demonstrations with the materials which they produce is even more exacting, but it is being done.

The task of preparing for demonstration lessons, even when the devices to be used are available, is not easy because there are few well-organized laboratory outlines available. In the interests of classroom efficiency, common sense would seem to demand that demonstrations should be planned in advance and rehearsed if possible. Thus it would almost seem to be a requirement that the mathematics department should have a special laboratory or workroom at its disposal. It is certainly true that, if some pupil is to give a demonstration which will help other class members understand a concept, then he should not be learning to demonstrate while his demonstration is supposed to be in progress. Another point that seems worth mentioning in connection with the use of demonstration devices is that, once a demonstration has been completed, opportunity should be given to the members of the class to manipulate the demonstration device individually if they desire. A pupil can sometimes clear up confusing details for himself even when he is unable to formulate questions concerning his difficulties. Handling a device by oneself is quite different from observing someone else performing a demonstration with it.

DEVELOPMENTAL AIDS

The term developmental aid as used in this article may be defined as a class activity in which each pupil is given an opportunity to investigate the meaning of a concept by developing a thought model from simple raw materials. To conduct such activities it is desirable that each pupil in the class be equipped with some sort of laboratory kit. Useful simple "tools" to include in such a kit are scissors, paper punch, razor blade, compasses, foot rule, and protractor. Other materials which will prove useful if included are color crayons, push pins, map pins, mucilage, elastic, rubber binders, short pieces of string, Scotch tape, pick-up sticks, two-piece jar

[1] The devices illustrated were produced by pupils from the Mathematics Department of Monroe High School, St. Paul, Minnesota.

covers, and a piece of cork tile 12″ x 12″ x ½″. Cork tile is obtainable from most floor covering distributors; it is included in the foregoing list of materials because its use offers a possible solution to the "work-table" problem. If it is at all possible each pupil should have an individual drawer or box stored in the room in which to keep his materials. Raw materials such as squared cross-section paper, construction paper, and cardboard strips should be distributed only as needed. For this type of activity it is desirable to have the room equipped with tables—preferably two-chair tables. Desks with large tops are to be preferred to lecture room arm chairs.

As an illustration of how the technique of developmental aids works, suppose we consider an approach by which pupils may be led to develop an understanding of the properties of the common quadrilaterals; namely, the general quadrilateral, trapezoid, parallelogram, rectangle, rhombus, and square. In proceeding with this activity the pupil would begin by fastening a sheet of squared cross-section paper to his cork tile with push pins and then forming a general quadrilateral with a closed loop of elastic and four map pins. Following this he might be directed to reform his original figure every time the teacher proposed a different requirement. In this way each new figure would reflect the addition of the requirement being proposed. If the following requirements—(1) one pair of opposite sides parallel; (2) both pairs of opposite sides parallel; (3) one right angle; (4) all sides equal; and (5) all sides equal and one right angle—are proposed as successive requirements in the order listed, the pupil will have the opportunity of discovering how the various quadrilaterals are related. Such an approach is certainly quite different from asking him to distinguish between the various figures by memorizing definitions.

As another illustration of this type of activity, pupils might be led to discover the formula for the area of a parallelogram by having them construct different parallelograms on the pieces of cork tile with loops of elastic in such a way that all figures would have equal corresponding sides and the same line segment as their base. By counting squares included within the boundaries of the various figures thus formed, pupils should be able to discover in short order that something other than the lengths of the sides which are oblique to the base is the determining factor in finding the area. From experience this contributor can say that this is a fairly successful method for helping pupils arrive at the formula $A = bh$. The use of the developmental aids technique is, of course, time-consuming; but there is no substitute for it, if one wishes to give pupils an opportunity of experiencing the "feel" of making a genuine discovery. The secret of carrying such an activity toward the goal desired is to intersperse activity with questions that suggest further activity in the direction of the goal.

ANALYSIS AIDS

The third kind of aids listed in our classification is analysis aids. Actually an analysis aid is a demonstration activity which embodies some of the techniques inherent in the developmental aids technique; however, it does not, strictly speaking, involve the use of a previously completed demonstration device such as was implied in the discussion of demonstration aids. Nor again, is the kind of activity here intended of the individual experimentation type explained above in connection with the developmental aids technique. Since the idea we have in mind is a little difficult to communicate, we take the liberty of introducing a simple analogy. Consider for a moment the demonstration put on by a sidewalk barker who sells cake decorators. All of us have probably marveled at the seemingly expert ad libbing and apparent spontaneity with which this artist assembles and uses the gadget which he seems intent on selling. However, if we delay taking leave of him until he has repeated his act several times, we become aware of the fact that he is actually following a prepared script which is a clever arrangement of motion and monologue. As he brings different parts of his gadget into use, he directs the onlooker's attention to them. In this way he keeps up a running play for attention.

Suppose we apply this idea to a mathematical situation, and for definiteness let us assume that a teacher wishes to illustrate concretely that $x^2 - y^2 = (x + w)(x - y)$, or that the difference of two squares is equal to the product of the sum and difference of a pair of corresponding edges. The teacher begins by holding up a square piece of cardboard and identifying it as x^2 (Figure 5-a). Then he cuts out a smaller square from one corner of the original square and identifies it as y^2 (Figure 5-b). Finally he cuts off the small rectangle which is indicated by dotted lines in Figures 5-c, arranges it as in Figure 5-d, and asks his pupils to identify the dimensions of the new figure.

In a similar but more complicated demonstration it may be shown that the difference of two cubes, $x^3 - y^3$, yields the factors of this expression. An effective way of doing this is to cut up a cube of cheese. As still another illustration of this technique it is possible to illustrate how certain properties of parallel lines cut by a transversal may be employed in building a home-made periscope with pocket mirrors and a cardboard mailing tube, or how inaccessible distances may be measured by building a stadia tube with two fruit jar covers and a piece of tagboard.

All of these are interesting and we would like to elaborate further at this point, but we are subject to the limitations imposed by lack of space. We trust, however, that the illustrations presented are sufficient to enable the reader to understand some of the important features of this technique. In the first place, concept development depends primarily on building (or

dissecting) something; the *use* of the finished device (if there is one) is secondary. The method is not trial and error; it consists of a carefully executed procedure which should be planned in advance. All materials must be prepared ahead of time and organized almost like a surgeon lays out his instruments in preparation for an operation. Finally, the building process must have continuity. The separate elements of the concept being developed must be identified and related. This means that the builder must be able to supply a commentary which is adapted to the abilities of the learners.

PROJECTS

Let us turn now to the fourth classification of teaching aids listed above, projects. In general, the word "project" implies some kind of planned activity which may be carried on over a period of time. This definition is fairly broad and includes such widely differing kinds of activities as field trips, collecting objects, preparing bulletin board displays, giving special reports, making slides, planning scrapbooks, *etc.* Inasmuch as the project technique is not only an aid but also a method in itself, we might conceivably devote this entire section to a discussion of project activities by means of which the learning of mathematics may be enhanced. However, since this article deals specifically with concrete materials, it is felt that any discussion of the project method in this particular section should reveal how the method is related to the use of concrete teaching aids. So while there is no intent to belittle the types of project activities already listed, we feel that a further discussion of similar types may not be of particular interest to the reader at this point. Accordingly, we propose to explain what the method means in terms of pupil-production of multi-sensory learning aids.

In this connection the project method is of value in two ways. For one thing it may possibly be employed as a means of making demonstration type aids available for use by the class. However, this purpose should certainly not be allowed to become the sole consideration in any use of the project assignment technique. Actually, this is not a problem with aids that are planned for demonstration purposes. Usually, the plans for such devices grow directly out of the classroom experience and, even when the teacher does find it necessary to enlist the assistance of a pupil in order to have a device available for future use, the anticipation of what it may be used for is usually sufficiently compelling to motivate the pupil to action.

In practice, the collection aspect of the project method regulates itself and the real value of the method lies in the way in which it benefits both the pupil who produces a device and his classmates as well. The building of a device provides a pupil with an extremely fine opportunity to develop desirable thinking abilities. To build a device a pupil must organize the information which he brings to a situation and decide for himself in what

respects his information is incomplete or hazy. At first thought it might appear that an immature pupil cannot be expected to organize a problem in sufficient detail to be able to analyze it, but experience with this sort of thing has been encouraging.

Needless to say, a pupil's handiwork should be displayed in the classroom so that his classmates will have the opportunity of discussing his work with him. An untold amount of learning often results from such informal exchanges, and it is not uncommon to find that what one pupil has attempted to illustrate with a device may never have to be developed formally by the class. In this connection it should be remarked that it is not absolutely necessary for a pupil to produce a device in order to benefit from it. As a matter of fact some pupils learn much about a concept by examining a device which they could not possibly have produced themselves.

As a rule, individual assignments work out better than assignments made for groups. The experienced educator will recognize in this fact a practical means of providing for individual differences. From what has been said, it should certainly not be construed that multi-sensory devices *must* be related to class activity. The better pupil often finds it much to his liking to plan the construction of a concept demonstrating device which is only slightly related to the classwork. In fact, the project for which he assumes responsibility may be of interest only to him. A teacher who would use this plan as a means of providing for individual differences should supply himself with a card-file of projects from which pupils may select assignments. Each card in such a file should carry a description of a project, a drawing if one is needed, and some information relative to the difficulty of the task. This last bit of information will help the teacher in assisting pupils with the problems of selecting appropriate assignments.

The demonstration devices pictured in Figures 1-4 are illustrative of the kinds of project assignments under discussion. The first two of these (Figures 1-2) were produced by sophomore geometry pupils of about average ability. Those pictured in Figures 3 and 4 were produced by second course algebra pupils who were about average for their group. Figure 6 pictures a dissectible combination lock. Its construction is such that opening combinations may be changed at will. The boy who developed it said at the year's end that the unit on permutations and combinations was the most interesting part of the course. While this device was never considered formally by the class, every pupil in the class learned how to operate it and to compute the total possible number of cylinder settings. Figure 7 pictures an electrical "computing" machine for solving first degree equations. Figure 8 pictures a mechanical device for drawing the sine wave. Both devices were developed by pupils whose abilities are undoubtedly superior.[2]

[2] The devices illustrated in Figures 6-8 were also produced by pupils from the Mathematics Department of Monroe High School, St. Paul, Minnesota.

MEASURING AND DRAWING INSTRUMENTS

There remains for discussion the classification of concrete materials introduced at the beginning of this article as measuring and drawing instruments. Drawing instruments include such things as compasses, straightedge, template, string and rubber suction cups (for drawing conic sections on a chalkboard), pantograph (for drawing similar figures—enlargements and reductions), T-square, tri-square, parallel rulers, *etc.*

Some of the common measuring instruments include such materials as a rule, meter stick, steel or cloth tape, protractor, vernier caliper, micrometer, sextant, transit, clinometer, hypsometer, angle mirror, spherometer, target rule, *etc.* It is possible for pupils to produce some of these as project assignments, but generally speaking pupils are rather critical of measuring instruments. They are quick to dismiss a measuring device as unsatisfactory if it does not live up to some respectable standard of accuracy. So while it may be desirable for the members of a class to undertake the construction of a few instruments (the angle mirror for one), it would seem to be best for them to have considerable experience with inexpensive commercially produced instruments. The number of instruments of each kind needed for a class to work with depends to some extent on the grade level of the pupils. For a group which is learning to use some particular instrument, there should be enough of this kind available so that each pupil can participate several times during a class period. For pupils taking up advanced work, this requirement is not essential. With such pupils the class can be divided into a number of smaller groups and each group given a different problem and different instruments with which to work. One of the main objections to activities involving the use of instruments, as usually conducted, is that there are invariably more spectators than participants. While it is true that even inexpensive instruments are relatively costly, this is one place where it is better to buy than to improvise.

In the foregoing pages of this article, an attempt has been made to give a picture of what it means to use concrete materials in the mathematics classroom. In developing the outline of certain evolving practices, we were guided by two considerations, clarity and brevity. Needless to say, the examples offered to help explain different uses of concrete materials are barely illustrative. So ramified have the uses of concrete materials in the mathematics classroom become that several volumes might easily be devoted to a respectable discussion of this growing technique—to say nothing of an exhaustive treatment. Yet, all of what precedes relates to the use of only one type of material which mathematics teachers use today. To mention some others, there are such materials as films, filmstrips, and free and inexpensive materials made available to the mathematics teacher in ever-increasing numbers by business houses such as insurance companies, stock brokers, business machine companies, electrical supply companies, automo-

bile manufacturing companies, and many others. In addition, there are such things as maps, charts, graphs, mathematical games, and booklets in such variety that they defy classification. The limitations imposed by lack of space precludes further elaboration.

D. EVALUATING INSTRUCTION IN MATHEMATICS

MAURICE L. HARTUNG

ALTHOUGH the current outbreak of criticisms of public education has not centered upon mathematics instruction, there are widespread opinions that achievement in this field has been steadily deteriorating. There is, however, no substantial evidence for this view. On the contrary, there are many reasons for believing that, in this field, instruction and achievement are better today than ever before. A brief summary of the basis for this statement follows.

First, complaints about low levels of achievement in mathematics have been aired for many years, but, with the development and use of objective testing instruments at about the time of World War I, the great range of individual differences became clearly evident. Since that time reports of deficiencies based on personal observations and data from various samples of pupils have continued to appear. Some of these samples are obviously biased. There is a general tendency to overlook the fact that millions of pupils have also learned considerable mathematics, and some have learned a great deal.

The problem of determining what has really happened to achievement is in part a statistical one of considerable complexity. There have been many changes in the social environment and the secondary-school population that complicate comparisons. For example, in 1900 only 4.7 per cent of the total youth population between the ages of 14 and 17 were enrolled in algebra. This figure has steadily increased until by 1949 it reached 17 per cent. This in one of the facts almost always ignored in discussions of mathematical education. As a consequence of this and other related facts, it follows that algebra is being taught today not only to many more pupils, but also to pupils with a much wider range of abilities and interests than was formerly true.

In the meantime there have been some notable changes in the mathematics curriculum. Most of these changes were not the ideas of educational "crackpots." They were proposed by and had the authoritative backing of professional mathematicians of high standing. The basis for many of the

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changes may be found in the Report of the National Committee on Mathematical Requirements of the Mathematical Association of America, published in 1923.

Today the average teacher of mathematics is better trained in both mathematics and in professional work, uses better teaching methods including a variety of multi-sensory aids, and strives much harder to develop genuine understanding of mathematical concepts and principles in addition to the essential manipulative techniques than was true of the average teacher in the past. If a valid comparative study could be made, it is highly probable that it would show that the modern teacher and pupil are doing at least as well as their counterparts in former years. With a much greater fraction of youth studying mathematics than was ever true before, the mathematical competence of the country has undoubtedly increased rather than deteriorated.

Even if the situation in the country as a whole is favorable to mathematical education when viewed dispassionately and in perspective, there is of course still much room for improvement. As steps toward improvement are taken, they should be carefully guided by comprehensive and balanced evaluation programs. Since administrators know that the methods of evaluation used in the school have definite effects on the nature and the efficiency of the instruction, no space needs to be given to arguing for acceptance of this idea. Moreover, this is not an appropriate place to discuss the details of preparing and administering evaluative devices such as tests. Instead, attention will be focused on policies administrators should follow in improving the evaluation in their schools. Perhaps these suggestions will be viewed as overly dogmatic. If so, it will be an unfortunate consequence of an effort to be specific.

Administrators should encourage teachers to set up a comprehensive evaluation program for mathematics instruction in the school. This will involve at least: (a) the systematic use of achievement tests of the type usually called "standard"; (b) the adoption of certain general policies about the methods to be used by teachers in their regular classroom evaluations; and (c) the use of a variety of techniques to collect data needed in the appraisal of those aspects of the program that are not measured by tests.

There are still many schools that have little or no program of the kind outlined above. Each teacher evaluates the work of his own classes quite independently of other classes and of other schools. There are some schools that do have testing programs, but the tests are imposed by administrative authority. Where this is true many teachers justifiably think that the purpose of the testing is to check up on them. They resent the implication that they may be doing an inadequate job. The statement above that "administrators should encourage" implies neither a *laissez-faire* nor an authoritarian policy. The program should be planned by co-operative methods, and the "check-up" aspect applies to all concerned—the pupils, the teachers, the administrators,

and the community. If inadequate achievement by pupils and teachers is found, it may be due in part to inadequate administrative leadership and inadequate community support for the program.

There are administrators who oppose the use of standard achievement tests because they believe teachers will focus the teaching on passing the test and this will restrict the development of a more modern curriculum and the use of modern methods. Whether or not this occurs will depend a great deal on what the test measures and how the administration uses the test results. If the test is really a good one—if it does not include obsolescent content, if it requires thinking as well as recall, and understanding as well as skill—there is nothing wrong with preparing the pupils to do as well as they can with it.

If achievement tests are to have beneficial effects, they must be carefully selected by the teachers, or carefully constructed by them. Some commercial tests are out of date as to the choice of or emphasis upon certain content, or as to the norms provided by the publisher. Before purchasing a test, a committee of mathematics teachers should analyze every item in it by asking themselves, "What does this item measure? What kind of behavior does a successful response require? What kind of *thinking?*" They should recognize that some items demand little more than the *recall* of a fact or technical term. Other items require *understanding* of a concept, or seeing relations between two or more facts, or similar behavior. Still others may demand *operative* skill, such as is involved in the multiplication of a polynomial by a monomial. A few items may call for *interpretation* of a situation or relation. Some items, and especially "problems," require the ability to *apply* facts and concepts in new situations. When teachers have analyzed several tests in this way, marking each item with a code symbol that indicates the predominant type of behavior it requires, they should decide how well a particular test corresponds to their objectives and emphases of the local program. If they are making a final achievement test for departmental or even wider distribution, they should keep such an analysis going as they build items.

A good program, and a good test, will demand all the types of behavior listed above, and others also, in reasonable balance as to emphasis. An analysis of this sort is helpful not only in judging tests, but also because is suggests questions about the curriculum of the local school. Numerous studies have shown that emphasis upon understanding the principles tends to produce better achievement of other kinds. Limitations of space and questions of the practicality for the average teacher prevent any description here of the methods and the evaluating devices used in these studies. Each teacher can, however, work in his own way on the development of understanding and the measurement of it, provided he is fully convinced of its importance.

Test items that go beyond the measurement of recall and skill and call for understanding often look different from the sort of exercise the teachers have been using. They look "too difficult," or the teacher may say, "I don't teach it that way." This reaction may lead to the rejection of a superior test, and the acceptance instead of one that neglects to measure understanding adequately.

Either a suitable commercial test or a locally prepared one should be administered annually in every mathematics class. The administrator can encourage this program by seeing that adequate funds are available for the purchase of tests. He can really facilitate it by making arrangements to have the scoring done by machine or by competent clerical help. It is wasteful of teacher time to use it in routine scoring. Instead, the energies of the teachers should be directed toward analyzing and interpreting the results and toward making plans for an improved instructional program.

When standard tests are used, the first concern of teachers and administrators is: "How do we compare with the norms of the test?" If the scores are above norm, all concerned are pleased and are prone to self-satisfied relaxation. The administrator, especially, often seeks an opportunity to inform the PTA and the public generally on how well the school has done. If, however, the scores are below the norm, there is little disposition to publish the results; and there may be some rather vigorous suggestions to the teachers that something is obviously wrong and should be corrected immediately.

It is true that something is needed; namely, analysis and evaluation. The analysis may show that, when ability and resources are taken into account, an above-norm average score is no higher, or not as high, as should be expected. On the other hand, when ability and resources are taken into account, a below-norm average score may represent praiseworthy achievement. Particular care must be taken to be sure the norm is not out of date. As pointed out above, there have been notable improvements in the mathematics curriculum in recent years. Modern teachers are striving to develop understandings and appreciations that were relatively neglected in the former curriculum. Few, if any, modern tests adequately measure the achievement of these objectives. The norms of some older tests definitely put a premium upon a degree of manipulative facility which is desirable if accompanied by adequate understanding, but which was formerly achieved only by selected groups of students or learned by memoriter methods by students of average or inferior ability.

It is probably true that teachers and administrators have too much faith in standard tests and national norms. For most purposes, local norms are sufficient. When this policy is adopted, the averages and other relevant

data are recorded and the aim should be to raise the average from year to year unless conditions so change as to make this expectation untenable; for example, if the general ability of the student group declines as a result of changes in the community. Moreover, special attention should be given to the effect of local decisions to change content, emphasis, method, or composition of class groups. For example, some schools now recommend that students who do not meet certain requirements as to achievement in arithmetic and as to intelligence quotients should take general mathematics in preferance to or prior to algebra. If the arithmetic achievement level or IQ threshold changes, the mean scores on the achievement tests in general mathematics and algebra may be expected to change also. It is amazing that such seemingly obvious considerations are still widely ignored by school personnel. Perhaps it is a consequence of the tendency to grab for the table of national norms as soon as the tests have been scored. It would be better to compare the results with achievement in the same school in prior years, and to seek to interpret trends in relation to instructional policies and characteristics of the local student body.

A second opportunity for the administrator to provide leadership comes in connection with the adoption of general policies to be used by teachers in their regular classroom evaluations. Here again the problem becomes one of steering between the *laissez-faire* and authoritarian positions. In a large school under a *laissez-faire* policy, a great variety of practices may be observed in use. Some teachers test every day—others test relatively infrequently. Some teachers give the pupils responsibility in the evaluative process. Other teachers do not permit the pupils to check their own homework—papers are exchanged between pupils or the teacher always collects the papers for private checking or use in starting a fire. Most teachers put heavy emphasis on test scores for determining grades, and use tests as motivating devices. Some teachers put the emphasis on test scores primarily as diagnostic indicators of progress in the learning task. They make no pretense of "averaging" them numerically at report time.

There are schools in which one finds rules from the office specifying the frequency with which tests are to be given; the way scores are to be recorded in the teacher's grade book; the relative weight to be assigned to classwork, homework, and to examinations; as well as many other practices. Sometimes these are issued solely on the authority of the administrator, and sometimes they are the result of faculty discussion and action.

All of these practices are especially noticeable in mathematics instruction because of the heavy reliance that must be put upon written work. Mathematics uses symbols in distinctive and powerful ways, and learning mathematics involves learning to use and understand its symbolism. The situation is further

complicated by the fact that, in several branches of mathematics, manipulative skill with the symbols is an essential component of adequate achievement; and, unfortunately, many teachers know little more about the subject that is represented by this manipulative aspect. As a result they tend to put undue reliance and faith in drill without an adequate understanding of the concepts involved. Likewise, the short tests they use daily or weekly too often demand little in the way of understanding or genuine problem solving.

Among the various testing and evaluation practices observable in schools, some are better than others. One may reasonably ask that the teachers responsible for mathematical instruction in a school examine their routine evaluation practices critically. They should agree among themselves as to what should be departmental policy and what should be left to the discretion of the individual teacher. To start their discussion, they might consider and debate the following propositions:

> All homework, short quizzes, *etc.* should be checked and corrected by the pupil himself. For routine exercises, answer books or lists should be freely available. The pupil should regard this work as done for himself, not for the teacher. He should understand that his achievement will be checked in other ways and under controlled conditions. He should keep his entire file of written work for each unit in a notebook, and be prepared to have it collected in one bunch at the end of the unit. The teacher will normally examine it from time to time during work periods in class or as help is given on individual difficulties. Homework of the sort ordinarily assigned should count relatively little in evaluating the work on the unit. A comprehensive and thorough unit test should be the major source of quantitative data for evaluating work on the unit.

There need be no insistence that the teachers as a group agree with all of these perhaps controversial *dicta,* but discussion of them is, at the very least, likely to reveal variations in practice that are often disturbing to pupils and to parents.

Finally, the modern teacher of mathematics must rely upon means of evaluation other than tests and homework. These may include records of non-written work produced (for example, the student may make a model, exhibit, or bring clippings of mathematical interest). Questionnaires may reveal changing patterns of student interest and satisfaction with their work in mathematics. Student evaluations in writing of a course may lead to valuable suggestions for making the work more vital to them. Mathematics teachers have perhaps used such devices less frequently than teachers of other fields simply because the formal aspects of mathematics are so easily tested. A little encouragement by administrators would do much to help teachers broaden the evaluation base and bring increased satisfaction to them, to the pupils, and to the public.

E. USE OF THE LIBRARY

DANIEL B. LLOYD

"BEWARE of a man of one book" was admonished by Robert Southey, an English poet of the early nineteenth century. The single textbook, no matter how well written, does not suffice in content, in viewpoint, nor in perspective to portray a field of knowledge to a class of pupils. This is true in mathematics and the other exact sciences, as well as in the social studies and humanities wherein more numerous viewpoints and philosophies exist and necessitates broad reading. Although the availability of books to the general public has increased perhaps one hundred-fold since that time, most school systems have recognized their necessity too inadequately in the modern educational program.

To quote Clarence Day: "Books are the most remarkable creation of man. Nothing else he builds ever lasts." Love of books distinguishes the cultured person from the one of superficial proclivities. The wealth of the race is perpetuated in bound volumes in spite of our fast living pace. A friendship for books, a favorable attitude toward reading, and an acquaintance with great books are among the most lasting and satisfying values that the schools can offer. Calvin Coolidge once said, "The school is not the end, but only the beginning of an education." This implies that the school must foster habits, attitudes, and inclinations that will grow through the years within the indivdual. Books provide both impetus and implementation for this growth.

Mathematics has been defined in a number of different ways, which is rather natural because it has several distinct and equally important aims. It has been called the language of science, the grammar of exact thinking, the science of numbers, the art of calculation. It has been characterized as the most perfect system of thought and the noblest expression of the human mind. It is the language of precise statement, the only universal language—possibly more world-wide in character and form than any other type of human expression; in fact, it is about the only discipline with which all peoples are in agreement.

There are more mathematicians today than ever before and yet many more are needed than are available. One factor alone will probably double the demand for mathematics in the next ten years. This is the electronic computing industry. It is requiring, and will increasingly require in the future, mathematics trainees on all levels, from those who actually construct, operate, and maintain the machines, to those who schedule, design, and conduct advanced research in the field. Mathematics, far from being a static subject, is growing in modern times like never before. Everyday problems such as

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weather prediction and weather control are typical of those that are languishing from neglect and awaiting more powerful mathematical techniques for their solution.

Mathematics is an exact mode of expression. It is a very precise language and, like any language, requires intense application for its mastery. The mere mechanics of its expression absorb most of the time in the classroom. For instance, algebra, being a system of abstract forms, requires two or three years for thorough mastery and facility in manipulation. Just as in music, in which some drudgery, such as the learning and practicing of the scales, must precede any attempts to render beautiful compositions, so in mathematics we find many of the more interesting side lights and applications deferred until later years, and only after the less courageous pupils have been weaned to other more alluring or immediately satisfying subjects. This preliminary, yet important, discipline too often screens all but the hardy, or better motivated souls. Many thus never learn what mathematics really is beyond its mere elementary mechanical symbols used in computation. The sad part is that many of those discontinuing the subject possess ample ability to pursue it successfully. Too many emerging pupils believe mathematics to consist merely of computing, of working problems which have been explicitly stated, or of grinding out answers from luckily chosen formulas—either memorized or otherwise provided. Their failure to grasp the true meaning of mathematics may be likened to the inability to see the forest on account of the trees.

The breadth of purpose of mathematics, both as an art and as a science, cannot be grasped from the textbook alone. To give the pupil a broad prospective of the field of mathematics is an important function of the modern school library. It should provide access to authentic material which will acquaint him with the nature of mathematics, its application to other fields, its place in everyday life, and its effectiveness in elevating our standards of living. These attitudes, knowledges, and appreciations thus gleaned effectively supplement those acquired in the classroom. This enrichment may be incidental browsing, or planned assignments, or both. In any case, it constitutes a valuable adjunct to the teaching program.

Reading avidity is a mark of the superior student. This interest he evinces in study halls, libraries, and at home. Even the best school libraries fail to satisfy his interests. The slightest suggestion on the part of the teacher starts him going. Both magazines and books he is likely to devour. Often interested in more than one field, he pursues them unremittingly, like hobbies. He often does creative or experimental work in some area and reads all available background literature associated with it. He and his kind are our greatest national asset. He deserves our best co-operation and encouragement. Too often we "flunk" in our duty toward him.

Supplementary material for enriching and motivating the class assignments is a problem confronting every teacher. Routine assignments from the textbook need "spicing" to enliven interest and broaden the outlook of the class. There is scarcely a topic for which this does not apply to some extent. Library assignments for this purpose can be made for the entire group if a careful coverage of this supplementary material is advisable. Otherwise it can be assigned to one or more individuals or to a portion of the class—and generally the ones who require less of the routine drill or remedial work. If an oral report is made to the class, all will then benefit to the extent desired. This procedure lends itself well to the method of differentiated assignments. Outside reading assignments can be made to individual pupils more profitably if the teacher is aware of the pupil's special interests or hobbies.

Spontaneous or incidental evidences of interests on the part of the pupil should never be neglected as opportunities for outside reading assignments. A pupil who volunteers an interesting application of some topic in class should be encouraged to delve deeper and bring back his findings to the group. Thus a spark of interest in mathematics may be kindled which will arouse enthusiasm in the others as well. The school library can be valuable in such cases if appropriate material is on the shelves. This is especially true if the teachers are thoroughly familiar with the volumes which the library provides.

Library assignments by teachers should be made judiciously if the maximum advantages are to be gained. Too extensive or unwieldy assignments can become a hardship and react unfavorably in the end. Particularly in science and mathematics there is the possibility that some material found may be too difficult to be absorbed by the pupils on that level. The level of difficulty of the material assigned should be ascertained by the teacher in advance in order to avoid such a contingency. The teacher should also make sure that the assigned material is available on the shelves. Also, too many pupils should not be assigned to the same book, and if certain books are in heavy demand they should be kept "on reserve" so that their use can be equitably shared.

Many teachers assemble a collection of books in the classroom for use by individual pupils or groups of pupils during class time. This encourages the use of reference materials under close supervision and assures ready access to them in a timely manner. Such plans can often be worked out with the school libraries in such a way that other teachers and pupils are not unduly deprived of such books. It is more feasible when the library has duplicate copies of certain books that are in greater demand.

Using the library for supplementary work can assist materially in educational, vocational, and personal guidance—really a function of every teacher and counselor. Vocational interests spring from reading in any subject, and the

teacher of that subject can best advise on technical phases in that field. The library should contain appropriate books describing vocations in the various fields. The vocations utilizing mathematics, which would interest a pupil majoring in that field, are quite numerous but not too well known. It would seem reasonable that such pupils should have access to some descriptive literature of this kind, even though it was not entirely comprehensible at their educational level.

A library should sometimes display other material of educational value besides books. The author has used the library to advantage in staging mathematics exhibits, using the walls for charts and posters, the tables and window sills for geometric models, instruments, and equipment. Being locked after school, it becomes a safe repository for expensive items which can remain on display for several days and nights.

The *Standard Catalog for High School Libraries* is a standard reference for ordering books. It is published by the H. W. Wilson Co., 950 University Ave., New York 52, N. Y. A new edition is published every five years, the next one being 1957. However, it contains very few listings in the field of mathematics compared with other fields which are more amply represented. It, therefore, seems desirable to provide here a well-balanced list of such books. The author is pleased to present the following list in the belief that it will be helpful to the principal or librarian who will be ordering books for his school library. They are listed under four headings: (A) History and Biography, (B) Applications to Other Fields, (C) Enrichment Material, and (D) Recreations.

SUGGESTED BIBLIOGRAPHY

A. History and Biography

BELL, E. T. *Men of Mathematics*, Simon and Schuster Co., 1937. A biographical chapter on each of 30 outstanding mathematicians. A small part of the material will transcend the comprehension of the high-school student.

BOYER, L. E. *Mathematics—A Historical Development*, Henry Holt and Co., 1945. Good supplementary material for high-school courses, with numerous problems and examples. Answers to odd numbers. Topics embrace the fields of arithmetic, algebra, geometry, trigonometry, measurement. The treatment is broadening and enriching to any course.

CAJORI, FLORIAN. *History of Elementary Mathematics*, Macmillan Co., 1927. Though old, this book is a standard reference, written by a recognized authority. Deals with evolution of numbers systems, computation, algebra, geometry, and trigonometry.

DANTZIG, T. *Number—The Language of Science*, Macmillan Co., 1933. A philosophical treatment of number, developed historically, from early mysticism to modern mathematical analysis. Much of this is intelligible to the high-school pupil and will broaden his perspective.

HOOPER, A. *Makers of Mathematics,* Random House, Publishers, 1948. The dramatic unfolding of the epic of mathematics, from finger counting to calculus, presented in a simple and fascinating manner.

SANFORD, VERA. *A Short History of Mathematics,* Houghton Mifflin Co., 1930. A brief chronological survey, followed by a more detailed historical development by separate fields, through the calculus. Includes chapters on famous problems, instruments, weights and measures, and mathematical textbooks.

SMITH, D. E. *History of Mathematics,* Ginn and Co., 1923-25. (2 volumes): Vol. I *General Survey of the History of Elementary Mathematics;* Vol. II *Topical Survey of the History of Elementary Mathematics.* Comprehensive, documented, and well indexed, standard authority in the field. Volume I is chronological, and Volume II deals with areas and topics within single chapters.

SMITH, D. E. *Number Stories of Long Ago,* National Council of Teachers of Mathematics, 1201 16th St. N. W., Washington, D. C., 1951. Entertaining stories about numbers, actually told by a story-teller, but with authentic and instructive mathematical content. Good particularly for intermediate grades and junior high school.

B. Applications to Other Fields

BUELL, C. E. *Mathematics for the Sheet Metal Worker,* Pitman Pub. Co. Written by a man experienced in the trade, it is helpful and motivational for a boy interested in this line of work.

FELKER, C. A. *Shop Mathematics,* Bruce Pub. Co., 1941. Throughout the book, shop mathematics is correlated with shop practice by means of practical material.

GHYKA, M. *The Geometry of Art and Life,* Sheed and Ward, 1946. Explains the mathematical principles underlying form, symmetry, and proportion. Clear and simply developed, it enhances appreciation of both fields—art and mathematics.

KUEHN, M. H. *Mathematics for Electricians,* McGraw-Hill, 1941. Simple electrical problems with D.C. and A.C. circuits. Large number of problems involving high-school mathematics. Includes instruction in the slide rule.

McGEE, R. V. *Mathematics in Agriculture,* Prentice Hall, Inc. The boy interested in farming will find a large number of applications of elementary mathematics to agricultural economics and agricultural mechanics.

NAIDICH, J. *Mathematics for the Aviation Trade,* McGraw-Hill. Elementary mathematics applied to aeronautical design, construction, and maintenance. Designed for student mechanics on the job, all the problems are directly connected to the aviation trades. Chapters on the steel rule, decimals in aviation, areas, volumes, weights, angles and construction, graphic representation of airplane data, compression ratio, valve timing, bend allowance.

OSTEYEE, G. *Mathematics in Aviation,* Macmillan Co., 1942. Prepared in cooperation with the Civil Aeronautics Administration. Terminology of aviation, air express, design problems, center of gravity, radius of action, interception, *etc.*

SCHAAF, W. L. *Mathematics for Mechanics,* Garden City Pub Co., This book has value for a boy interested in this trade, as well as motivational value for his mathematics.

SLADE, S., and MARGOLIS, L. *Mathematics for Technical and Vocational Schools,* John Wiley Co., 1946. Practical elementary mathematics through trigonometry applied to machine and woodworking. Strength of materials, screw threads, pulleys and gears, and various machine shop problems.

C. Enrichment Material

ABBOTT, E. A. *Flatland,* Dover Publications, N. Y., 1952. A popular treatment of the fourth dimension in fairy story form.

ANDERSON, R. W. *Romping Through Mathematics,* Alfred Knopf Co., 1947. A popular account of the development of the various branches of elementary mathematics through calculus.

BISHOP, C. C. *Practical Use of the Slide Rule,* Current Publishing Co., 212 5th Ave., N. Y., 1944. Clear and well-organized instruction with illustrations. Shows many short-cuts of practical value in various situations.

COOLEY, H. R.; GANS, D.; KLINE, M.; and WAHLERT, H. E. *Introduction to Mathematics,* 2nd Edition, Houghton Mifflin Co., 1949. A survey emphasizing mathematical ideas and their relations to other fields of knowledge. Deals with the nature of mathematical systems; includes an elementary treatment of non-Euclidean geometry, theory of relativity, and infinite classes.

DRESDEN, ARNOLD. *An Invitation to Mathematics,* Henry Holt and Co., 1936. Aimed toward general education in the field, with a minimum of technical details. A broad coverage of mathematical ideas and processes, including some more advanced ones.

GARDNER, R. S. *Instruments for the Enrichment of Secondary School Mathematics,* Edwards Brothers, 1951. Description and mathematical explanation of numerous simple measuring and computing instruments, including abacus, verniers, slide rules, pantograph, and several surveying instruments.

HARRIS, C. O. *Slide Rule Simplified,* American Tech. Society, 1943. A simple, but thorough, instruction in the use of the slide rule. Many examples, problems, and review questions.

HOGBEN, L. *Mathematics for the Million,* W. W. Norton and Co., 1940. A good, and thoroughly functional, survey of elementary mathematical concepts, from arithmetic through calculus. Almost all of it is readable on the high-school level. Well explained and illustrated. Considerable historical development.

JONES, B. W. *Elementary Concepts of Mathematics,* Macmillan Co., 1947. This treatise provides deeper insight into elementary concepts of mathematics with interesting applications. Elementary number theory, logic, probability, topology, and some advanced topics in modern geometry.

KOKOMOOR, F. W. *Mathematics in Human Affairs,* Prentice Hall Co., 1946. An elementary treatise of mathematical concepts and processes. Unusually clear and well illustrated, with a plethora of examples; historical development, and with human interest.

LLOYD, D. B. *A Golden Decade of Popular Mathematics,* 1948, The author, Wilson Teachers College, Washington, D. C. (50c) A comprehensive bibliography of periodical references to help the pupil broaden and deepen his understanding and appreciation of various branches of mathematics. The bibliography is classified topically.

LOOMIS, E. S. *The Pythagorean Proposition,* Edwards Brothers, Ann Arbor, Michigan, 1940. This is a comprehensive collection of proofs of this famous theorem. Nearly 200 different proofs based on dissection, algebra, geometry, trigonometry, and even calculus and mechanics are included.

MANNING, H. P. *Fourth Dimension,* Peter Smith, 347 Fifth Ave., N. Y. A popular treatment of the theory of the fourth dimension.

MOORE, J. H., and MIRA, J. A. *The Gist of Mathematics*, Prentice Hall Company, 1942. A wealth of supplementary material for high-school courses, from elementary algebra to elements of calculus; ample examples and problems on all topics. Well prepared and illustrated.

National Council of Teachers of Mathematics, 18th Yearbook, *Multi-Sensory Aids in the Teaching of Mathematics*, Bureau of Publications, Teachers College, Columbia Univ., N. Y., 1945. Best standard reference on making of mathematical models and other learning aids. Wide variety of suggestions for home-made devices and equipment illustrating mathematical principles. Profusely illustrated.

National Council of Teachers of Mathematics, 20th Yearbook, *The Metric System of Weights and Measures*, Bureau of Publications, Teachers College, Columbia Univ., N. Y., 1948. Comprehensive picture of present status of metric usage. History of its growth and desirability for world-wide adoption.

ROW, T. S. *Geometric Exercises in Paper Folding*, Open Court Pub. Co., 1941, $1.25. Tells how to make geometric figures and designs by folding paper. Most of the exercises require elementary geometry, but some require knowledge of advanced principles.

SHUSTER, C. N., and BEDFORD, F. L. *Fieldwork in Mathematics*, Yoder Instrument Co., East Palestine, Ohio, 1935. Description and mathematical explanation of numerous surveying instruments, both home-made and commercial types, from angle-mirrors to transits, levels, and sextants. Practical surveying methods and field work practices. Numerous problems and projects. Slide rule, sundial, verniers, scale drawings, *etc.*

YATES, R. C. *The Trisection Problem*, Edwards Brothers, Ann Arbor, Mich., 1942. A brief history and a proof of the impossibility of trisecting an angle by ruler and compass alone. Numerous approximate solutions with comments.

D. Recreations

BAKST, A. *Mathematics—Its Magic and Mastery*, D. Van Nostrand, 1941. An extensive collection of mathematical recreations of wide variety involving elementary mathematics.

BALL, W. W. R. *Mathematical Recreations and Essays*, Macmillan Co., 1947. Classical English work in the field of famous mathematical recreations. Much historical material is included, a chapter on calculating prodigies and the three famous Greek problems.

DEGRAZIA, JOSEPH. *Mathematics Is Fun*, The Gresham Press, N. Y., 1948. A collection of 200 entertaining problems of the unique type (with solutions), requiring only high-school mathematics. Numerous problems in cryptic arithmetic are included.

JONES, S. I. *Mathematical Clubs and Recreations*, S. I. Jones Co., 1122 Belvidere Dr., Nashville, Tenn., 1940. Mathematical recreations and games suitable for club programs. Organization of clubs.

JONES, S. I. *Mathematical Nuts*, S. I. Jones Co., 1122 Belvidere Dr., Nashville, Tenn., 1940. Companion to the other two books. Additional brain teasers and thought-provoking exercises.

JONES, S. I. *Mathematical Wrinkles*, S. I. Jones Co., 1122 Belvidere Dr., Nashville, Tenn. 1940. Additional fascinating exercises; fourth dimension, mensuration, short methods, *etc.*

KASNER, E., and NEWMAN, J. *Mathematics and the Imagination,* Simon and Schuster, 1940. A treatment of arithmetical and geometrical fallacies and paradoxes, the underlying idea of calculus and its applications, squaring the circle, pi, *etc.*

KRAITCHIK, M. *Mathematical Recreations,* W. W. Norton Co., 1942. Numerous pastimes, magic squares, chess problems, the calendar, permutational, and other arithmetical and geometrical problems.

LICKS, H. E. *Recreations in Mathematics,* D. Van Nostrand Co. Instructive and fascinating questions, problems, and items in arithmetic, algebra, geometry, trigonometry, analytic geometry, calculus, astronomy, the calendar, mechanics, and physics.

LIEBER, L. R. *The Education of T. C. Mits,* W. W. Norton Co., $2.50, 1944. Whimsical style, but instructive in content, it deals with mathematics in a fascinating way, emphasizing axiomatics.

MEYER, J. S. *Fun with Mathematics,* World Book Co., 313 Park Hill Ave., Yonkers 5, N. Y., 1952. A book of mathematical curiosities and tricks designed for young people but of interest to all ages. It extends as far as calculus.

MOTT-SMITH, GEOFFREY. *Mathematical Puzzles for Beginners and Enthusiasts,* Blakiston Co., Philadelphia, Pa., 1946. Some 200 puzzle problems, with solutions, involving elementary mathematics and logical methods. Dissection, permutational, decimation, probability, cryptic arithmetic, anagrams, and numerous other types are featured.

NORTHRUP, E. P. *Riddles in Mathematics—a Book of Paradoxes,* D. Van Nostrand, 1944. Entertaining fallacies and paradoxes in arithmetic, algebra, geometry, probability, logic, and higher mathematics.

STEINHAUS, H. *Mathematical Snapshots,* Oxford Press, 114 5th Ave., N. Y., 1950. Mathematical recreations and other puzzles, related to maps, chess, knots, partitions, *etc.*

F. A DESIGN FOR A MODERN MATHEMATICS CLASSROOM

DONOVAN A. JOHNSON

RIGHT now plans are being drawn for constructing new schools and modernizing old buildings that will cost billions of dollars. In the immediate future the secondary-school population will begin increasing at a rate that will require more billions for new school construction. As the future teachers in these new classrooms, we have a great responsibility as well as an opportunity to help in planning classrooms that will be in harmony with modern educational practice. We need to have a planned program if we are to participate in designing classrooms and avoid the mistakes of the past. Many new schools have placed major emphasis and money on the recreational and vocational aspects, important as they are, while the mathematics classroom has been the rectangular space equipped with the traditional blackboard and pupil desks.

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IMPORTANCE OF THE CLASSROOM

The classroom is the focal center for most learning activities that are provided by the school. It is the place in which the teacher and the pupil spend the major portion of the school day. It is the place where the tools of learning are to be available and used. It is the place where the motivation and guidance of learning activities are concentrated. If this is true, then it seems imperative that the classroom be planned and equipped so that it is a pleasant, stimulating, comfortable room in which teacher and pupil enjoy working.

If the classroom is to provide an environment that will stimulate learning activities, the classroom must provide for the physical needs of the pupils. To do this, adequate light, proper acoustics, comfortable temperature and ventilation, adequate space, and furniture that is suited to the activities of the classroom must be provided. But this is only part of the story. As in an efficient shop, laboratory, or office, the equipment must be appropriate and properly located. The materials and tools needed should be at the fingertips of the workers so that they can be placed in use and convenience and with a minimum of distraction. Only then will these materials and tools become a part of everyday instruction. It is the purpose of this article to suggest classroom plans that are adapted to the activities of modern instruction in mathematics. Suggestions will be made regarding the design, the equipment, and the utilization of the classroom. Teachers participating in local building programs may need to adapt these suggestions to the local program.

PLANNING THE MATHEMATICS CLASSROOM

Whenever a building program is started in a local community, teachers should take an active part in the planning. Ideally the architect and administration should consult the mathematics teachers regarding classroom needs. If this does not happen, and it may not, then the mathematics teachers should get together to formulate plans and make recommendations. A good point of departure in making these plans would be to ask the questions, "What activities should be carried on in the mathematics classroom in order to attain accepted goals? What would a dream classroom be like?" Obviously, not all requests will be attainable either because of cost or inability to incorporate all ideas in the building plans. Certainly the teacher will be more likely to get many of his requests if he can show how the plan he proposes will result in an improved mathematics program.

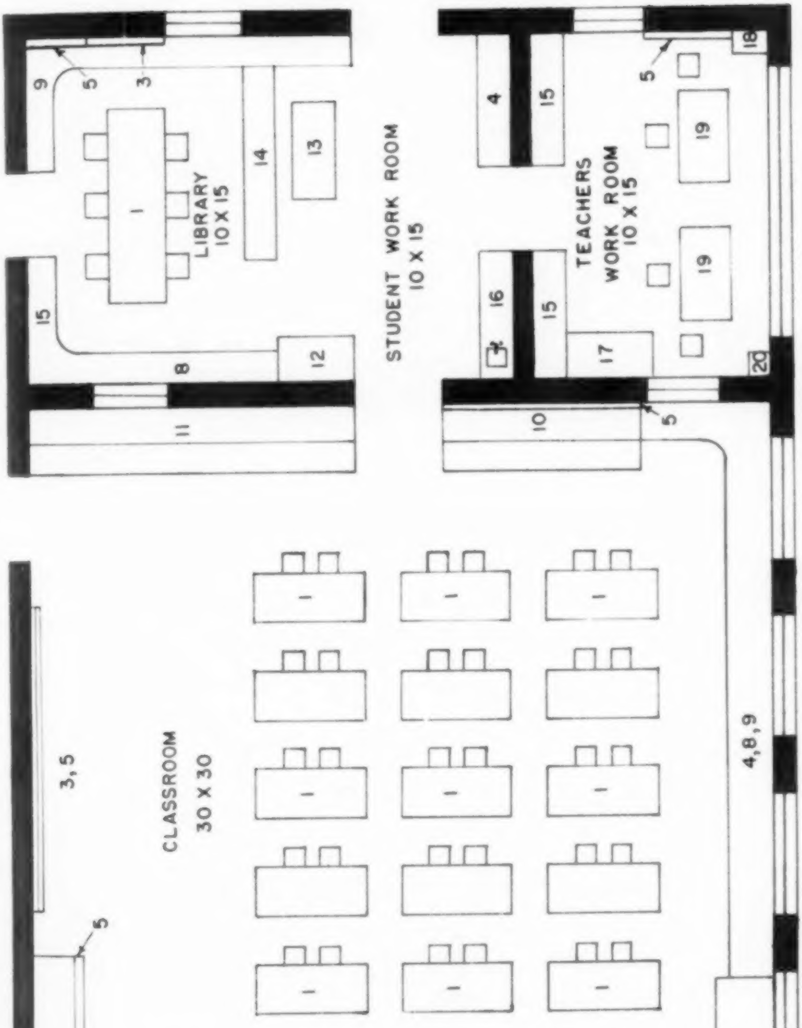
As you plan your new mathematics department, you will need to collect information about possible classroom designs. A perusal of catalogs, professional articles, and school architecture periodicals will offer some suggestions. However, many of the suggestions found in the literature are out of date, inadequate, or not suitable to local needs. Visits to new schools will often

be helpful. When you do this, be sure to visit other departments and elementary classrooms. Another fruitful source of information will be classroom teachers and the pupils themselves. Since most building projects include an appropriation for equipment, it is important to include the equipment in your plans. Too often no one has thought that the mathematics classroom needed equipment in the same way the shop or laboratory does. Modern practice is emphasizing mathematics as a laboratory science.

If the mathematics classroom is to meet the needs of modern instructional practice, let us consider the question as to what activities take place in the classroom. Most classroom activities will be included in the following list: reading, listening, writing, drawing, group conferences, individual instruction, remedial instruction, making charts, making models, putting up exhibits, correcting papers, writing at the board, reporting to the class, making measurements, recording papers, planning and completing committee projects, drill games, dramatizations, business organizations, painting, and recreational activities. To meet the major problems of mathematics instruction such as motivating the pupil, making abstract principles concrete and meaningful, and providing for individual differences, the classroom should be a learning laboratory where relationships are discovered and principles are applied. Thus, it is apparent that a rectangular space with blackboards and fixed desks is completely out of date. The modern classroom must have plenty of space that provides for a variety of seating arrangements, adequate instructional materials, and the equipment and facilities necessary for good housekeeping.

When the mathematics classroom is being designed, it would seem that the school architect is the person best qualified to determine what provision should be made for such items as the following: room size and arrangement, built-ins, wall equipment, outlets for audio-visual equipment, outlets for water and gas, decoration, acoustical treatment, and fixtures for light, heat, and ventilation. However, some of these items are dependent on instructional plans. If tables are to be used instead of desks, floor space should be planned for this furniture. If instructional activities are to include experiments similar to those in science, it is necessary to have water and gas outlets. If laboratory activities are to be carried on, adequate storage in the form of cabinets must be available. If the room is to have a classroom library or a work room, appropriate space and shelving is needed.

The writer's ideal of a classroom suite includes a large room for group instruction and three small rooms or partially sectioned areas for individual work as shown in Figure I. Folding screens, bookcases, or cabinets or casters can provide a useful and versatile means of forming these areas, if it is impossible to have individual rooms. One of these small rooms or sections would be the teacher's work area. It would be the place for the teacher to keep her materials, make her plans, and conduct student conferences. Another small


LIBRARY
10 X 15
STUDENT WORK ROOM
10 X 15
TEACHERS
WORK ROOM
10 X 15
CLASSROOM
30 X 30

room would be used as a workroom. This room would provide the space, materials, and equipment for building models, storing field instruments, making exhibits, drawing charts, and completing individual projects. The third small room would be a classroom library where books, pamphlets, periodicals, and clipping files would be available for committee work, remedial instruction, recreational activities, and individual projects. The placement of these rooms between two classrooms would make it possible for two teachers to share them. This ideal classroom suite is similar to that found at the University of Minnesota High School. The pictures and drawings reproduced above show a complete plan and a classroom in operation.

The large classroom should have at least two walls for shelves and cabinet built-ins. Using the space under the windows is one way of finding storage space that is frequently wasted. Another way of providing more cabinet space is a built-in cabinet behind sliding chalkboard or bulletin board panels. The cabinet space should provide a variety of drawer space of varied dimensions for the storage of materials, such as charts, maps, drawing paper, glue, shears, *etc*. Small drawers about 10″ by 15″ by 3″ should be available in such quantity that each pupil can have a drawer for his equipment such as graph paper, ruler, books, and compasses. These drawers will prevent exasperation and the loss of time that happens so often because the pupil appears in class without the necessary tools. Having taught in a classroom in which these drawers are provided, the writer has found them extremely useful. One built-in cabinet should have a sink with running water, gas, and electric outlets so that science experiments can be performed. Another cabinet section should provide several file drawers for the storage of teaching materials. Much of the cabinet area should provide open shelving for the display of books, pamphlets, models, and projects. Some of this shelving should be mounted at an angle for the display of magazines, pictures, and books in a manner similar to that of a magazine rack. The use of wall strips for the mounting of shelf brackets is one way of obtaining a versatile arrangement of shelving. Some shelving should have glass doors with locks so that fragile or costly material can be displayed without danger of loss. Use every available space for built-in storage. As in a home it seems impossible to get enough storage space in the classroom. Besides, it is likely that materials of instruction will be far more extensive in the future.

The walls of the classroom provide the key to establishing a mathematical atmosphere; althought, it is essential that adequate chalkboard space be provided. Other types of display space are also very necessary since there is much less chalkboard work being done in today's classroom than in the past; chalkboard space on two walls should be ample. A large amount of bulletin-board space is highly desirable. This can be provided at the side of or above the chalkboards and above storage cabinets. One way of increasing the

amount of bulletin board and chalkboard space is to have sliding panels. This makes it possible for a given space to be used either for chalkboard or bulletin board. It also permits material to be prepared in advance and then brought into view at the appropriate time. If these panels are the doors for a storage case, it is possible to have a combination of chalkboard, bulletin board, and exhibit shelves at the front of the classroom readily available for instructional purposes at the proper time. A simple means of increasing the display area is to use acoustical tile on the wall. Material can be readily pinned on these tiles. Instead of an entire wall being acoustical tile, the laboratory school at San Diego State College has partially covered the walls by mounting the tile in attractive patterns and at the same time using them for display space. Another convenient means of presenting teaching materials is a map rail with hooks mounted on a track at the top of chalkboards and bulletin boards. These books are needed for hanging equipment such as the model slide rule, blackboard campasses, graph stencils, or charts. The front of the room should also be provided with a screen so that visual aids can readily be projected. Outlets for the use of projection equipment, tape recorders, radio and TV sets should be located for maximum convenience. It is assumed that the architect has made ample provision for darkening the room at any time of day and the necessary acoustical treatment for this equipment.

In connection with the classroom suite, the mathematics department should have a corridor display case. Exhibits in this case can be an effective way of showing the pupils, teachers, administrators, and visitors the role of mathematics in society. With shelves that may be varied in arrangement or removed, a cork or peg board backing, electrical outlets, and good lighting, this exhibit case can be a place to display a great variety of mathematical materials. One of the best ways of familiarizing the public with education is to show them student products.

EQUIPPING THE MATHEMATICS CLASSROOM

After the classroom space has been provided, the next problem is to furnish it with the furniture, equipment, and materials that are so essential to effective instruction. Every teacher needs a large executive type desk, several filing cabinets with locks, a cloak closet, bookcase, bulletin board, and a storage cabinet. A typewriter with a mathematical keyboard, a typewriter stand, and a ditto duplicator should be available to the members of the mathematics department. The workroom area should have a large work bench, storage space for tools, field instruments, construction materials, a table with chairs, bulletin board, chalkboard, easel, and exhibit shelves. The committee room should have tables and chairs, bookcase, filing cabinet, bulletin board, chalkboard, and exhibit shelves.

The most satisfactory classroom furniture seems to be tables with unmarable formica tops and chairs for each pupil. These tables and chairs should be adaptable to the varied heights of pupils. Tables will permit a variety of arrangements for group work or individual work as well as a large working surface, which is so important in mathematics.

Materials and equipment for the mathematics classroom should include the following:

1. *Measuring instruments:* Rulers, yardsticks, steel tapes, meter sticks, square measures, cubic measures, micrometer, vernier, thermometer, speedometer

2. *Chalkboard equipment:* Protractor, compass, colored chalk, special blackboard, graph stencil, template for three dimensional drawings

3. *Drawing instruments:* Drawing board, T-square, triangles, protractors, compasses, pantograph, proportional dividers, set of blueprints, scissors, grid graph for proportional drawings

4. *Surveying instruments:* Transit, level, sextant, hypometer, plane table, alidade, angle mirror, ranging poles, arrows, magnetic compass, Jacobs staffs, target poles, stadia tube

5. *Models:* Geometric solids, dissected cone, models of theorems of solid geometry, abacus, napiers bones, three-dimensional graphs, geometry boards, dynamic geometry set, products cube, linkages, airplanes, trains, ships, houses, bridges, contour maps, kaleidoscope

6. *Mathematical instruments:* Demonstration slide rule, individual student slide rules, abacus, navigation instruments, astronomy instruments, map projection device

7. *Science apparatus:* Balance and weights, seconds, pendulum, levers, gears, inclined plane, resolution of forces, photometer, beakers, funnels, flasks, bunsen burner, ring stands

8. *Audio-visual aids equipment:* Sound motion picture projector, opaque projector, slide and filmstrip projector, equipment for making slides, bulletin board exhibits, tapes and tape recorder, felt and felt board, title board with letters

9. *Collections:* Charts, posters, graphs, maps, pictures, booklets, three-dimensional pictures, projects, business forms, cartoons, quotations, photographs, clippings of mathematics articles, puzzles, bibliographies, textbooks, workbooks, games, calendars, problems, booklets

10. *General equipment:* Books, magazines, pamphlets, duplicator, wall pictures relating to mathematics

11. *Games:* Commercial and home made

12. *Toys:* Erector set, Makit Toy, Mek-N, Ettes, Hootnany, Tinker Toy, Blocks

13. *Construction materials:* Cardboard, tag board, plywood, balsa wood, hardboard, plastics, glue, paint, wire, elastic thread, wax paper, thumb tacks, adhesive wax, brads, needles, rubber cement, colored scotch tape, masking tape, model airplane dope, brush pen, colored chalk, colored ink, punch and eyelets, colored cardboard, panels of composition board, nails, screws, modeling clay, aluminum foil, copper sheet, colored string and yarn, plaster of paris, mold material, suction caps, gummed letters, and figures, sand paper, colored china marking pencils, scrapbooks, transparent picture protectors,

acetate sheets, construction paper, graph paper, cards, beads, cork panel, nuts and bolts, glass cement, paper fasteners, fishline, fishline weights, pins with colored heads, washers, curtain rings, letter stencils, flannel boards, title boards with title letters, rubber bands, soda straws, plastic tubes, clay, toothpicks, tongue depressors, and paper staples

14. *Tools:* Hammers, pliers, screw drivers, coping saws, cross-cut saws, hand drill with varied size bits, razor blades and holders, carving knives, soldering iron and cored solder, wire cutter, file, plane, glass cutter, shears, and metal shears

The provision of adequate classroom space and facilities alone will not insure effective teaching. However, when the teacher has these materials, he should be inspired to do his very best in teaching mathematics so that his pupils grow in understanding and appreciation of mathematics. Materials of instruction are effective only when used in the right way, at the right time, and for the right purpose. It is of fundamental importance that careful plans be made for the utilization and maintenance of all equipment. Good housekeeping, organized routines, and purposeful activities in a mathematical atmosphere should stimulate maximum learning.

Chapter VI.

In-Service Education

A. SOME COMMON PROBLEMS IN THE TEACHING OF SECONDARY MATHEMATICS

F. Lynwood Wren

IF ANY well-informed person were to attempt to formulate criteria for the evaluation of the educational programs in the secondary schools of our country, it is very likely that his thoughts would concentrate in three major areas: (1) How well does the program lead the pupils to appreciate the significant heritage from the past? (2) How well does the program prepare the pupils to capitalize on the great opportunity of the present? (3) How well does the program equip the pupils to meet the inspiring challenge of the future? We want our schools to produce cultured individuals, responsible citizens, and competent participants in some chosen area of interest. We want not only people who can become well-adjusted in their environment, but also people who can act independently and intelligently—people who have a background of knowledge that will enable them to form careful and unprejudiced judgments upon which they can act with courage and conviction.

The shaping of our school program is a problem in which a large group of people share joint responsibilities. The administrator, the classroom teacher, the supervisor, the counselor, the psychologist, and the subject matter specialist must be concerned jointly with the careful solution of this problem. Likewise, each must realize that intelligent thinking will not be guided by selfish interest but rather by unselfish desire. The concern of such a co-operative group should be to reap the experience of the past, capture the poignancy of the present, and anticipate the possibility of the future in order that they might be woven into the most effective program possible for the education of our youth. In the planning by such a group, care must be taken not to be over-influenced by the insistence and imperativeness of present demands. Sober judgment must come out of the perspective of a background of knowledge anchored in the culture of the past. Freedom of choice and flexibility of interest must never be allowed to become inde-

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pendent of the continued threat of needless future inadequacies resulting from misinformed, short-sighted judgments. The demands of a program of mass education, such as is necessary in our country, make it imperative that the program be broad and flexible. However, the program planners must keep in mind that there is just as much, if not more, danger in the superficiality of horizontal expansion as there is in the profundity of vertical concentration.

So it is that, in the shaping of the mathematics part of the secondary-school program, there are many problems of common concern to the administrator, the classroom teacher, the supervisor, the counselor, the psychologist, and the subject-matter specialist. What are some of the more significant of these problems?

I. WHAT PLACE SHOULD MATHEMATICS HAVE IN THE SECONDARY-SCHOOL PROGRAM?

The emphasis in this problem *is not* on whether mathematics should occupy a place in the educational pattern of our secondary schools. Even in the days of the early American school when the needs for mathematical skills and information were meager and elementary, it was recognized that an educational program without mathematics would be inadequate and unbalanced. Through the intervening years there have been times when vacuous thinking on the part of a few over-eager zealots has resulted in recommendations that mathematics either be removed from the school program or be reduced to a pointless minimum. These individuals have not been the only ones to recognize that instruction in mathematics has not been producing the results that it should. Their error has not been in improper recognition of existing disease symptoms, but in the impetuosity and drastic nature of the remedy suggested. They have placed themselves in the position of the doctor who recommends drastic surgery for the removal of a diseased member of the body before making extended and honest effort to determine the nature, seriousness, and curability of the disease. Just as in the case of medicine, curriculum diagnosis frequently should call for intelligent, co-operative group consultation among those interested in and capable of passing informed and competent judgment.

The emphasis in this problem *is* on how can the subject matter content of mathematics be best adapted to meeting the needs of the multipurpose program that public education seems to demand. Many and varied are the interests, aptitudes, attitudes, ambitions, appreciations, and needs of the pupils in our schools. Many of these are active and demanding but many are latent, yet potentially of great significance both to the individual and to society. If there is any difference at all in emphasis, the school possibly should feel a stronger responsibility to discover and challenge latent potentialities than to nourish and satisfy active desires.

In this modern age that is rapidly becoming more and more scientific and mathematical in nature, there is a body of mathematical information and skills of significance to every educable individual.[1] Furthermore, there is an ever-increasing plea from the leading thinkers of our nation for the schools to exert every effort possible to discover and develop scientific and mathematical talent, whether active or latent. The schools not only must provide this minimum mathematical program but also must pay heed to the call from the leaders of our country. This challenge provokes many disturbing problems, some of the more significant of which are posed in the following questions:

1. What is the common minimum core of mathematical attainment which should be required of all students alike?

2. Should the work in the seventh and eighth grades be differentiated, or should a single unified program be required of all the students in these grades?

3. Should all ninth-grade students be required to take either algebra or general mathematics? If so, who should take which?

4. What should be included in ninth-grade general mathematics?

5. What students in the senior high school should take the sequential courses in algebra, geometry, and trigonometry?

6. What can be done to improve the sequential courses so that they will serve more effectively in developing genuine mathematical power?

7. Should special, or "second-track," courses be developed for the senior high school, to serve the general educational needs of those students who lack the ability or the interest to profit substantially from the sequential courses? If so, how extensive should these courses be, and what should they include?

8. Should students who do not take the sequential courses in mathematics be required to take at least one year of general mathematics in the senior high school?

9. How could a "double-track" program be offered in a small high school?

10. How can general mathematics be made to have in the eyes of students and parents (and also of teachers) a status of "respectability" equal to that commonly accorded to the sequential courses?

11. If it can be assumed that the secondary school should aim to develop mathematical literacy in all its students, of what, precisely, should this mathematical literacy consist?

12. What place should arithmetic have in the secondary-school program, and what should be done to make it fulfill its function more effectively than it has in the past?

13. Should the attainment of some specified minimum standard of proficiency in arithmetic be required as a condition for graduation from high school?

14. Commercial arithmetic is often given in high school. Should a special course in shop mathematics be offered, too?

15. Should a course in consumer mathematics be given in the twelfth grade? If so, what should it include? Should it be a required course for all seniors? If not, who should take it?

16. Should more emphasis be placed on teaching for meaning? If so, should the increased emphasis be on social meaning (applications) or on mathematical meaning (concepts and relationships)?

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[1] Commission on Postwar Plans, Second Report, *The Mathematics Teacher,* 38 (1945), 195-221.

17. If such outcomes as appreciation, generalization, critical judgment, *etc.*, are important, better methods are needed for evaluating attainment in these directions. What methods could be used effectively to this end?

18. What can be done to challenge the interests and serve more effectively the needs of the very superior students?

19. What provision should be made in the junior college for students whose needs are not well served by the regular sequential courses in college mathematics?[2]

II. AT WHAT GRADE LEVELS AND HOW SHOULD THE VARIOUS MATHEMATICAL CONCEPTS, SKILLS, APPRECIATIONS, MEANINGS, *etc.*, BE PRESENTED?

This question, as well as the previous one, has very significant implications for the mathematics program in the elementary school as well as in the secondary school. An authoritative solution possibly would call for intensive experimentation that would extend over a long period of time. Some experimentation, with not too convincing results, has been attempted at the elementary level of instruction. There is no denying the magnitude of the problem nor the concern it should cause in the minds of all individuals who have a real interest in the educational program of the child.

Not only is the problem one of proper placement of materials to be taught, but also it is a problem of emphasis and interpretations appropriate to the mental and mathematical maturity of the pupil. The emphasis of instruction must be on the development of meanings as well as concepts and skills. At all times it must be kept in mind that efficient and effective study of mathematics is systematic and not incidental. A pupil cannot be expected to accomplish much in applying the fundamental operations to fractions unless he has basic understandings of the nature of each operation. These understandings are developed most effectively in the work with positive whole numbers, where the relative simplicity of the mechanics affords ample opportunity for careful attention to the intrinsic nature of the process. Competent performance in division prescribes at least abilities to multiply and subtract. The teacher of the elementary grades should realize that, while it is perfectly correct for a pupil to be taught that he cannot subtract a larger number from a smaller number, there will come a time later in his school work that he will learn that he can perform such a subtraction. The teacher at this later level of instruction must accept the responsibility of making it clear to the pupil that he is experiencing an extension of his concept of number rather than merely discovering mathematical ambiguities.

These problems of grade placement of subject content and instructional emphasis are of major significance in the shaping of an effective educational program for the youth who are enrolled in our schools. They are not too susceptible to the armchair philosophy type of solution.

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[2] Butler, Charles H., and Wren, Lynwood F., *The Teaching of Secondary Mathematics* (2nd ed.) New York: McGraw-Hill Book Co. 1951. Pp. 83-84.

III. WHAT ARE SOME OF THE MOST EFFECTIVE MEANS OF STIMULATING AND MAINTAINING THE PUPILS' INTEREST IN MATHEMATICS?

It is axiomatic to state that one of the most important tasks, and at the some time one of the most difficult tasks, which confronts the secondary-school teacher is that of creating and maintaining interest in the minds of the pupils. This is particularly true in the field of mathematics. Probably the most effective stimuli for arousing the interest of a pupil are to be found among the elements of novelty, usefulness, and intellectual curiosity. Such stimuli are not so "evident to the naked eye" of the immature junior high-school or senior high-school pupil in an area so unemotional and systematic as mathematics. Parents, along with teachers and other school personnel, have a great responsibility to share in trying to help the children have real opportunities to discover and develop significant interests and aptitudes in time-tested areas of learning. While it is true that attention must be given to the immediate livelihood needs of the present, it must be kept in mind that future needs and interests are hard to forecast. Basic training in all fundamental areas of learning is merely a protection against frustration and disappointment in later anticipation of ambitious desires.

Too frequently discussions of motivation resolve themselves into considerations of the relative merits of various means and devices to be used in the classroom for the purpose of awakening the interest of the pupils. Tricks, puzzles, models, posters, films, slides, exhibits, club programs, and other such devices have their place. It should never be forgotten, however, that they are merely aids to effective teaching. They can never replace good teaching and "unless careful planning precedes activities which involve the use of instruments or material aids, and unless the plan envisions for these aids very definite and particular mathematical contributions, their use might easily degenerate into just a sort of entertainment."[3]

Devices and material aids might give a temporary boost to interest, but it will take a competent, well-informed, and inspiring teacher to continue to stimulate and maintain a real active interest. Administrators must keep this fact in mind. Too frequently the systematic nature of mathematics gives rise to the feeling that anyone can teach mathematics. This is far from true. Mathematics is a difficult subject to teach, and all precautions should be taken to see that teachers in the elementary schools and teachers of mathematics in the secondary schools are competent, well-informed teachers with an appreciation of mathematics as an instructional medium. Such teachers will be able not only to point out to the pupils the many practical motives for the study of mathematics, but also to impress them with the cultural and general educational values to be found in those basic meanings, appreciations, and

[3] *Ibid.*, p. 148.

skills which are distinctly mathematical in nature yet play such a significant role in the evolution of our social order.

When considering the secondary-school program, teachers and administrators will have to face the need for intelligent planning to meet problems in motivation. They should recognize that subject-matter areas, as well as the more spectacular areas of dramatics, music, and sports, need material aids as well as attractive classroom atmosphere to help enrich and enliven instruction. The following questions have been suggested as possible aids in evaluating various procedure that might be suggested to meet the many problems of motivation:

1. Is the proposed procedure likely to be effective?
   a. Does it draw upon motives actually present in the learner?
   b. Is it designed to utilize a combination of several motives in the learner?
   c. Is it appropriate for the age level of the learner?
   d. Is it based upon recognition of a goal by the learner, and does the learner believe he can achieve the goal?
   e. Does it motivate many students or just a few?
   f. How long is the motivation likely to persist?
2. Is the motivation of a desirable type?
   a. Does it lead the student to value the learning experience itself rather than external rewards?
   b. Will it widen and deepen the interests of the learner?
   c. Does it tend to develop desirable attitudes toward the content or skill and toward the teacher?
   d. Are the goals which are set actually attainable?
   e. Does the motivation tend to strengthen attitudes necessary for democratic citizenship?
   f. Is the motivation consistent with the promotion of good social relations between students?
3. Is the procedure practicable?
   a. Is the required expenditure of time and money within the means of the school?
   b. How well can the procedure be controlled in practice?
   c. Does the teacher know how to administer the procedure?[4]

IV. HOW CAN WE PROVIDE FOR A BETTER PROGRAM OF GUIDANCE IN THE SECONDARY-SCHOOL MATHEMATICS PROGRAM?

"No matter whether you plan to go on to college or not, no matter what you plan to do after college, chances are you won't have enough mathematics. For many of the fellows and girls who went through school ahead of you found out they didn't have enough mathematics. So they had to make it up to take the courses they wanted to take or to get the jobs they wanted." "Mathematics is going to be important to you no matter who you are or what you expect to become after school." These two quotations are

[4] Hartung, Maurice L., *Motivation for Education in Mathematics*, Twenty-first Yearbook. Washingtion, D. C.: The National Council of Teachers of Mathematics. 1953. Pp. 65-66.

not from a teacher of mathematcis or from a curriculum specialist with particular interest in mathematics. They are from the pamphlet *Why Study Mathematics* which "was prepared by General Electric for the immediate purpose of stimulating a greater interest in mathematics—and to the ultimate end, not only of developing a greater supply of technically trained recruits for the ranks of modern industry, but also of providing tomorrow's graduates with the groundwork for a richer and more understanding living." They place in bold relief the immense responsibility for careful guidance of secondary-school pupils, even from the point of view of the practical, or vocational, values of mathematics alone. The *Guidance Pamphlet in Mathematics*[5] prepared by the Commission on Postwar Plans of the National Council of Teachers of Mathematics was for the purpose of making available to the high-school pupil information concerning the prerequisite mathematical demands of various academic and professional fields of study as well as of pointing out the extent to which successful accomplishment in many vocational fields is based on mathematics. It is not fanciful thinking, rather it is stating tragic facts, to say that ambitious desires have been thwarted, or at least their realization has been materially delayed; potential aptitudes and abilities have been uncultivated because of lack of discovery; and life patterns have gone through unfortunate change, all because of inadequate and uninformed guidance during high-school days.

The cultured and disciplinary values of mathematics also are to be considered in any intelligent program of guidance. Mathematics can make significant contributions in the fields of intellectual satisfactions, such as appreciations, understandings, critical thinking, and the systematic approach to problem solving. Teachers must be educated to realize that transfer of training is possible but it is not automatic; that it is their responsibility to discover that pattern of teaching which will lead to maximum transfer.[6] Administrators must co-operate in the planning of such patterns, and counselors must be alive to the potential results.

From a subject such as mathematics, characterized by sequential continuity and cumulative organization of content, the real substantial values are rarely, if ever, derived through informal incidental study. Consequently, in this day of expanded curricula and broad freedom in selection, it is imperative that wise counseling advise the high-school pupil to look beyond the present to those potential values which at the moment perhaps are not too obvious. In the entire program of secondary education, there can be no greater responsibility than the urgent need for co-operative planning of a significant, well-informed program of intelligent guidance.

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[5] Commission on Postwar Plans, Guidance Report, *The Mathematics Teacher*, 40, 1947, 315-339. Later published as the *Guidance Pamphlet in Mathematics*.

[6] Rosskopf, Myron F., *Transfer of Training*, Twenty-first Yearbook. Washington, D. C.; National Council of Teachers of Mathematics. 1953. Pp. 205-227.

V. WHAT PROVISIONS SHOULD BE MADE FOR PROVIDING FOR INDIVIDUAL DIFFERENCES IN SECONDARY-SCHOOL MATHEMATICS?

No one questions the existence of individual differences, but relatively little effective progress has been made in making intelligent provision for their presence among the pupils in our elementary and secondary schools. Wherever there are different individuals, not only will there be differences in ability, industry, initiative, interest, and attitude, but there will be differences in desire, rate, and retention of learning as well as in needs and ambitions. These facts combine to form one of the most acute problems, if not the most acute problem, in elementary and secondary education. Many solutions have been proposed and tried with varying degrees of success. Among the most prominent of these suggested solutions have been homogeneous, or ability, grouping, honors courses, differentiated assignments, directed study, individual instruction, diagnostic testing and remedial teaching, gradation of subject matter within topics, teaching by wholes, multiple-track programs, chronological promotion. When these varied suggestions are evaluated in terms of their psychological and logical bases, economical demands, and educational results, they spread over a wide scale from the psychologically unsound chronological promotion to the economically impractical individual instruction.

Certainly no one can deny that this extremely crucial and significant problem of the elementary and secondary school calls for the co-operative thinking of the most competent thinkers in our profession.

In this brief discussion no effort has been made to make an exhaustive list of important educational problems which should be subjected to co-operative study by professionally trained personnel. However, it is hoped that, through the consideration of these five top priority problems, the point has been made that the only intelligent approach to the solution of such problems is through co-operative effort of carefully trained, deeply interested, professionally minded personnel.

B. THE ROLE OF THE ELEMENTARY SUPERVISOR IN THE IMPROVEMENT OF INSTRUCTION IN ARITHMETIC

EDWINA DEANS

IN ARLINGTON COUNTY, a suburban Washington, D. C., area, the supervision of instruction in arithmetic is only one of the responsibilities of the general elementary supervisor. Also included are other subject areas of a general nature, such as language arts and reading, social studies, and

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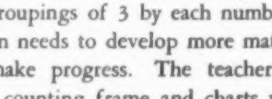
science. Among other aspects of the total school program for which the supervisor assumes some responsibility are the co-ordination and integration of areas, classroom organization, planning and evaluation, and guidance of children.

The elementary supervisor helps to improve instruction by (1) giving assistance to teachers and children in the classroom, (2) providing leadership for the development of curriculum materials, (3) serving as consultant for in-service education programs, and (4) working with parent and community groups. The present discussion will be limited to ways in which these four purposes are accomplished with regard to the teaching and learning of arithmetic.

ASSISTING TEACHERS AND CHILDREN IN THE CLASSROOM

The supervisior helps teachers become increasingly more aware of the thought processes of children. Two of the most valuable skills the teacher can possess are the ability to determine how the child *thinks* about his arithmetic and the ability to guide him through those activities and procedures which are most appropriate for helping him make progress in the direction of meaningful abstract understanding. Perhaps one of the greatest responsibilities of the supervisor is to help teachers grow in the development of these abilities. In rendering this service the supervisor has group and individual conferences with teachers and carries out demonstrations when requested to do so. By previous agreement with the teacher, the supervisor acts as a co-teacher, and participates actively whenever a contribution will contribute to the children's learning.

Children's individual difficulties are diagnosed—Miss Snyder asks the supervisor for help with Dan whose arithmetic paper looks like this:



The pattern is repeated until Dan has eight nines. His answer is correct but questioning determines that he has counted by ones though his picture shows grouping in fours and fives. In multiplying 13 by 10, Dan wrote 13 ten times putting groupings of 3 by each number. His answer was 1,300.

It is evident that Dan needs to develop more mature methods of multiplication before he can make progress. The teacher and the supervisor plan some activities using a counting frame and charts which will be self-teaching once he has learned the procedure. Some experiences which will improve his grasp of the number system are also planned to help him understand multiplication by ten and the relationship between multiplying by nine and by ten. Another child who also needs some practice, but who has a better

understanding than Dan, is invited to be his co-worker during this phase of arithmetic study.

Timmy's paper reveals many incorrect answers but enough correct ones that his teacher is puzzled to know what he is thinking. Timmy is asked to explain what he says to himself when working examples of this type:

$$\begin{array}{r} \overset{2}{\cancel{3}}\,\overset{1}{3} \\ -1\,8 \\ \hline 1\,5 \end{array}$$

Since his answer is correct, the teacher is surprised to hear his explanation which runs as follows: "Can't take 8 from 3; so I take 3 from 8; get 5; write 5. I borrowed 1, so I say 1 from 2; get 1; write 1." Other examples with correct answers are explained in the same manner.

Timmy evidently knows that the number must be changed to enable him to borrow. But beyond that he is at a loss to know what to do. He does not understand how to use the ten, rearrange it into ones, and combine the ten ones with the ones already in ones' place to make subtraction possible.

Experiences are planned which will help Timmy see that the number as rearranged is the same total amount he had before the rearrangement. He is helped to translate the examples into descriptive problem situations so he can keep in mind that the lower number is the part spent, given away, or used up, and that both ones and tens must be subtracted.

The supervisor participates in group planning—Mrs. Barr wants the supervisor to see the collection of measures which her fifth-grade children have brought into the classroom and to participate as they plan what use they will make of them. The children wonder if two containers of different sizes actually hold the same amount. They decide to find out. When they are sure of the size by experimenting with water, sawdust, or some similar material, they will label the containers appropriately. They suggest looking up the section on measures in the encyclopedia to see how much they can learn from the text and the pictures.

The supervisor suggests that they may wish to extend their study by learning about the history of measures, how inches, feet, and yards became the measures we use today. It is also suggested that they may like to collect food containers and study the labels. The following day the supervisor sends materials on the history of measures to the group to help them in their study.

The fifth-grade pupils have taken an informal inventory test on the multiplication and division facts. Before administering the test, the teacher instructed the children to circle every fact they did not know immediately. If they had to think a long time, count it out, think of other facts first, make pictures, or anything else of this kind, they should circle that example. The teacher

watched the children while they took the test and noted any visible evidences of methods of arriving at answers. Notations were entered on an inventory chart prepared for the purpose. Later the children's papers were analyzed for any further information they might reveal. Of course, the teacher's previous knowledge of the children's abilities helped her to check on how accurately individuals were able to carry through on this assignment.

In cases of doubt about methods of arriving at answers, the children were asked either to work a few examples aloud, saying exactly what they said to themselves as they arrived at their answers, or to give evidence of understanding by proving their answers. With all the available data at hand, the teacher invited the supervisor to help her analyze the results and plan with and for those children who had not yet gained control of the facts.

Half of the group of thirty-four children gave evidence of abstract thinking accompanied by good understanding of the facts. It was decided that these children needed only to be provided with maintenance activities. The children themselves helped to select pages in their textbooks which would provide this practice and, with the guidance of the teacher, to plan how often they needed to review in order to maintain a high level of efficiency.

"It will make a difference if we are spending most of our time doing fractions," suggested one child. "We won't be using these facts much then. But when we're doing long division we use them a lot."

Ten of the children knew most of the facts and had developed skill in determining unknown facts from known ones. The children in this group were helped to see that they had a good understanding of the facts and were now ready to memorize the facts they did not know. During a planning session these children suggested making individual number cards, using the facts they had circled on the test and any others on which their teacher thought they needed to work. They would put the fact on both sides of the card, with the answer on one side only, and study them individually and with a study partner. One child suggested that they make up their own number bingo games, using the facts on which they needed practice. The teacher offered to work with this group at least twice each week to check on their progress and to guide them in further work.

The remaining seven children made many errors on the test. The teacher said they experienced difficulty in remembering. Even if they knew the facts one day, they would probably not know them the next day. The teacher's analysis indicated that they had little understanding of the facts above the "fives." They arrived at their answers by a series of additions or subtractions, by making dot or stick pictures on their papers, and by counting. These children needed help with grouping, and with seeing the relationship between facts. The teacher gave this group of children three to five periods a week in which she taught them to group sixes, sevens, eights, and nines on

counting frames and read their answers with the help of their understanding of tens. They discovered the tables from six through nine with squared paper and finally by using a 100-dot chart. In all of these activities they were encouraged to practice each activity after it was learned, to get answers without counting, or with as little counting as possible, and to use a known fact whenever they could think of one which would be useful to them. They were constantly encouraged to think division facts from multiplication facts they already knew.

As these groups were spending a part of the time allotted for arithmetic, in the practice activities described, a parallel study of fractions was in progress in which all of the children participated.

Problems are explored in individual or group conferences—A third-year primary teacher wishes help in selecting experiences which will help her children learn multiplication and division meaningful. Together the teacher and supervisor discuss the activities suggested in the arithmetic guide, check those which seem most appropriate to use at the present time, explore the possibilities for the use of concrete or pictured materials in the early stages of teaching multiplication and division, and decide on an organization of the classroom which the teacher feels will best insure learning on the part of the children.

Three fourth-grade teachers in one school are interested in determining the contribution arithmetic can make to the social studies understanding which the children will acquire during their study of Virginia history. The materials available for the teaching of Virginia history are examined anew by the teachers to find out what possibilities can be found. During the discussion which followed, the teachers reached agreements on some of the important events of Virginia history. They listed these along with the dates on which the events occurred. They decided to encourage and guide their children in a number of activities which would help them to gain a better understanding of these events in relation to other events and to the present. One teacher suggested that some of her more able children might develop a time line beginning with the founding of Jamestown, establish an appropriate scale for indicating fifty-year periods of time, picture the selected events and label them appropriately, along the time line. Such a project could be shared with the group as a whole and would serve as a summary of events and as a reference when needed.

Other problem situations were suggested in which arithmetic is needed for the solution:

1. Finding the highest point of elevation in Virginia. The lowest point of elevation. The difference between these. How the elevation of Virginia compares with that of another selected state.

2. Finding the distance across the state from east to west. From north to south. comparing the distances with other states.

3. Determining the length of time it takes to travel from Washington, D. C., to Richmond by airplane. By train. By bus. By automobile. Finding differences in time for the various modes of travel.

4. Finding the increase in population in Virginia between 1940, 1948, and the present year.

5. Using a statistical table to determine which industry in the state is biggest from the standpoint of the number of people employed. Smallest.

6. Determining how long after the founding of Jamestown the church of Jamestown was built. When it was rebuilt. The number of years between the time it was first built and the rebuilding.

7. Comparing the rainfall and temperature for different sections of the state with figures reported for Arlington County. Comparing the reports on rainfall and temperature for Arlington County with the average for the state.

Mrs. Clayton wishes to know how she can make problem solving functional and interesting for her fifth-grade children. Following a conference with the supervisor in which some possibilities are discussed, she uses statistics from annual reports of the county and the school system as subject matter for some of the children's problem solving. Charts found in the annual report for the school system give them the breakdown by items on the cost of supplies and utilities for running the schools of Arlington County for the year 1951-1952.[1] Using these charts, the children determine the difference between the amount spent for one item over another, the cost of two or more items, the average amount spent per school for electricity, water, telephone, or fuel.

The children are interested in some of the information in the annual report from the county.[2] They learn the number of store scales, gasoline pumps, and fuel oil meters which were checked for accuracy during the year and the number which were found to be accurate. They use these data to determine the number which were inaccurate in each case and discuss the meaning of their findings in terms of steps to be taken to correct the inaccuaries. The implications of inaccurate measures for the owner and for the customer are pointed out.

From the annual report for the current year, the children obtain figures giving school membership for a five-year period together with the estimated membership for each of the five years.[3] They determine how the estimated membership compares with the actual membership for each year and the increase in membership from year to year. They find the increase in the population for the county, in the number of business establishments, and in the number of dwelling units for the same five-year period. They discover that it is recommended that a library should have 25 square feet of floor space for each pupil and on this basis they determine the number of pupils their own library will accommodate at one time. They discover that schools

[1] "Arlington Plans Its Investment in Youth," Superintendent's Annual Report, 1952.
[2] Annual Report, Arlington County, Virginia, 1952-1953.
[3] "Classrooms for Arlington's Children," Superintendent's Annual Report, Arlington, Virginia, 1953.

in the county are financed by money from the county, the state, and the Federal government. Some of the more able pupils use these data to make up problems for the other children to solve. They also develop answer sheets for ease in checking.

PROVIDING LEADERSHIP FOR THE DEVELOPMENT OF CURRICULUM MATERIALS

A need is recognized—If there is to be improvement in the pupil's learning of arithmetic, there must first be an awareness on the part of teachers of a need for help with instruction in this area. To be assured that such a need when expressed is of vital concern to the majority of teachers in a school system, there must be a group of teachers, representatives of the total teaching staff, which serves to inventory the problems of teachers and to set in motion the machinery for finding solutions to these problems.

In Arlington County, the Teachers' Council on Instruction serves this purpose. In the fall of each year, representatives take a poll of the problems of teachers in their respective staffs to be submitted to the Teachers' Council. School faculties are asked to select a number from among these for concentrated work during the year. The problems selected for study, therefore, are recognized as problems by the majority of teachers in the county.

An Arithmetic Guide Committee is organized—In the school year 1951 and 1952, one of the recognized problems was a need for improvement in arithmetic instruction, a need which the council felt could be partially met by developing a local arithmetic guide for grades one through nine. With the authorization of the Teachers' Council, an Arithmetic Guide Committee was formed. Members of a recent workshop group in arithmetic formed the nucleus of this committee. Other teachers joined the group voluntarily or by invitation in order to have representation from each school which desired to participate. Leadership for the committee was provided by supervisors and principals.

The committee acquires background—In the spring of 1952 the committee examined many courses of study in addition to the section on arithmetic in our *Virginia State Course of Study*, and read widely in the field of arithmetic in an attempt to gain background for the task ahead. During this time, meetings of the committee were spent in sharing information and ideas gained from readings, and in formulating a philosophy which would serve as a basis for making decisions and selecting content for the guide. Among the ideas accepted by the group were the following:

1. Arithmetic has two phases, a social and a mathematical phase. The two phases are interrelated.
2. Good teaching in arithmetic meets the needs of individual children.
3. Arithmetic must be meaningful for children.
4. Children need practice and drill. Drill is effective only after meanings have been established.

5. Good teaching includes continuous evaluation.
6. Number concepts develop slowly.
7. Grouping of children for some purposes facilitates the learning of arithmetic.

Early in their study the members of the group committed themselves to two goals. In the first place, they wished to have as wide participation as possible by all teachers in the county. In the second place, they felt that parents had much to contribute to the development of the guide and should be brought into the early planning stage.

Provision is made for wide participation by teacher—The committee hoped that the guide would provide the help teachers felt they needed and would serve as an instrument through which the good practices already going on in the county could be shared. A sub-committee developed a questionnaire through which all teachers were invited to list difficulties they experienced in teaching arithmetic and the difficulties their children experienced in learning arithmetic. They were also asked to describe procedures and materials which they had found of value in helping children learn arithmetic. In still another section of the questionnaire, a request was made for the social applications of arithmetic such as arithmetic related to the unit or work, arithmetic found in other areas but not related to the unit, and arithmetic used in carrying out the routine aspects of a school day.

Parents participate in planning the guide—At one of the early meetings of the committee, each member invited a parent from his school community to attend the meeting and to help in determining the content of the guide. Parents were asked specifically to address their thinking to the questions, "What difficulties have your own children or children of your friends had in learning arithmetic?" "What topics would you like to see included in the arithmetic guide?"

It was of interest during the last few minutes of this meeting to compare the suggestions of the parent group with the thinking done by the arithmetic committee at the previous meetings. There was much overlapping with the parent group placing much emphasis on problems of articulation between the grades and changes in methods of teaching. They also wished to know what parents could do to help children at home, and how home and school arithmetic could be integrated to further pupils' learning.

A tentative draft is developed—From the questionnaires filled out by teachers, the thinking of the committee, and the parent group, broad areas were determined and sub-problems in each area were defined. The organization was decided upon after much study and discussion by the committee. Throughout the preliminary planning period, both teachers and parents had expressed a desire for practical help and for some indication of grade placement and of sequence of abilities. Each area, therefore, was planned to incorporate a concise theoretical statement, abilities chart, including sequence and grade placement of topics, and suggested activities.

School staffs try out the tentative draft—When a tentative draft of the guide was completed, it was placed in the hands of teachers with the recommendation from the committee that the guide be studied by faculty groups and that methods and activities be tried out in the classroom. Members of the committee and of the supervisory staff served as consultants to staff groups as needed. Teachers were asked to make comments on margins and backs of pages concerning the value of the material, recommending changes and additions. All copies of the tentative guide were collected at the end of the year, and a sub-committee worked during the summer of 1953, concentrating most of their efforts into a two-week period, to make necessary revisions and do final editing.

What was the extent of teacher participation?—While all teachers did not take advantage of the opportunities offered, every teacher had the opportunity to participate through the school representative on the guide committee, by responding to the questionnaire, by trying out the tentative guide, and by taking part in staff discussions which followed. It is undoubtedly true that the greatest benefit from curriculum work of this type accrues for that group which has the major responsibility. All teachers, however, could participate according to interest and could keep themselves informed of the progress of the committee.

Arithmetic kits are prepared—The committee made frequent mention throughout the guide of concrete and semi-concrete materials which could be developed by classroom teachers to help children explore and experiment with numbers and to help the teacher in the presentation of new number ideas. It was the opinion of the committee that teachers should have samples of these materials available as aids to determining which materials would be of use in their own situations, and to serve as a guide in constructing materials of their own. Seven kits were developed, four for the primary level and three for the intermediate, which circulate from the teaching Materials Center upon the request of the school, and remain in the school for a period of six weeks. The kits contain some commercial and some home-made materials. Included are such materials as counting frames, inch cubes, flannel boards, number games, materials for teaching place value of numbers, number picture cards, old clocks, strings of spools, one hundred dot charts, and bulletins and booklets on arithmetic received from publishers.

Parents are invited to contribute—At the early planning meeting, parents had expressed a desire to know how they could help their children with arithmetic at home, while both parents and teachers expressed a desire for help with integrating home and school number experience. In order to meet these needs, the committee developed a questionnaire for parents to use in recording number experiences of their children. The principal and teachers from each school invited parents to list the home and community experiences

of their children which involved numbers and to develop some of these experiences in sufficient detail that other parents would be able to adapt them for use with their children.

The original intention of the committee was to incorporate this material into one section of the arithmetic guide. So much excellent material was submitted, however, that a bulletin for the use of parents was developed, *Uncovering Hidden Numbers, a Guide for Relating School and Out-of-School Number Experiences.*"[4] The following quotation from the preface of the bulletin sets forth recommendations for its use:

> The committee recommends that the booklet be used by teachers and parents to relate the school and out-of-school number experiences. It is suggested also that the booklet may serve as a useful tool for parent-teacher conferences. Those experiences which are appropriate for a child may be decided upon jointly by parent and teacher and checked for future reference in the parent's copy of the bulletin.

Perhaps the greatest value of this booklet to parents is the wealth of suggestions for number experience in the natural, everyday environment of the child, which help him learn more about number as he solves the problems he meets from day to day.

Follow-up activities are planned—In the fall of 1953, the *Tentative Instructional Guide for Arithmetic for Grades One Through Six* was ready for distribution to teachers. At the time of distribution, all principals were asked to plan follow-up staff meetings to study the guide.[5] The members of the committee and elementary supervisors assist the school staff chairman and the principal at these meetings. Usually the first meeting is devoted to a study of the guide. The second meeting is a workshop type at which teachers make definite plans for their own children or make materials which can be used in their classrooms. Often several teachers at a given grade level work together and prepare materials for co-operative use. Often materials are not desired, but rather a conference in which one or more specific problems in teaching are explored by a group of teachers with the guidance of the supervisor and principal.

The committee is still intact and expects to come together for an evaluation session before the end of the year. Teachers have been requested to keep records on two aspects of arithmetic which the committee felt were not satisfactorily developed in the guide. These were the arithmetic in all aspects of school living aside from the systematic planned phases and the arithmetic that is most useful with the child who is talented or gifted in mathematics. If the response of teachers warrants, a supplement to the guide will be developed during the coming spring or summer which will provide further assistance in these two areas.

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[4] *Uncovering Hidden Numbers, a Guide for Relating School and Out-of-School Number Experiences,* 1953, Arlington County Public Schools, Arlington, Virginia.

[5] *Tentative Instructional Guide for Arithmetic for Grades One Through Six,* Arlington County Public Schools, Arlington, Virginia, 1953.

SERVING AS CONSULTANT FOR IN-SERVICE EDUCATION PROGRAMS

Another major responsibility of the elementary supervisor is to provide leadership for study groups during in-service training periods. In Arlington County planning for in-service education is accomplished through an in-service planning committee composed of teachers from all levels, a principal, and members of the supervisory staff. During the two years in which this group has functioned, study groups in the teaching of arithmetic have been among the offerings.

Teachers participate in study groups—Some study groups have been of the discussion-study type in which the teachers themselves have tried to gain a better understanding of arithmetic, particularly of the changing emphases since their own school experiences. The study groups have also served as a means of sharing methods and materials which the teachers have found to be effective in guiding children's learning in arithmetic.

Laboratory experiences are offered—Other periods were spent in a laboratory type of experience giving teachers the opportunity to prepare materials which they could use in the teaching of arithmetic in their own classrooms. Materials made at these workshops were simple counting frames; ten-bead, twenty-bead, or one-hundred-bead frames; flannel boards and cutouts to use with them; pictorial charts; picture cards of number groupings; and the like.

Certain specific techniques are demonstrated—Demonstrations to meet certain specific needs were also arranged. Many teachers felt the need for help in guiding children's learning of the number system. As one teacher expressed it, "We have always taken the number system for granted. The idea that there is anything for children to learn about the number system is new to us." Teachers who had realized success in teaching the number system demonstrated their work with some of their own children. The children demonstrated their understanding of numbers in terms of hundreds, tens, and ones, and how an understanding of place value helped them in borrowing and carrying. At the discussion which followed the demonstration, many more applications and values to be derived from a study of the number system were pointed out. Teachers noted that such an understanding helped to prevent reversing the place in writing numbers, paved the way for success in borrowing and carrying, was useful in estimating quotient figures in division, and enabled the child to use judgment in determining the accuracy of his answer.

Released time is provided for curriculum study—Arlington County provides released time for curriculum study every other week. At this time children are dismissed one hour early in order to provide teachers with a substantial period of time on these days for the concentrated study of curriculum problems. Many school staffs have devoted at least two of these periods to a study of arithmetic.

Teachers work with children in a summer workshop—In the summer of 1952, a three-week workshop sponsored jointly by George Washington University and the University of Virginia gave a few teachers a unique opportunity to work with children who were having extreme difficulty with arithmetic. The teachers had the opportunity to do some diagnostic testing, to work with small groups and individual children, to observe demonstration teaching, to develop arithmetic materials, and to participate in discussions relative to the progress of the children.

The total group of children participated in carrying out a service project for summer workshop participants. They bought materials, prepared and served a mid-morning snack, kept records of sales and purchases, replenished stock, and did all the computation necessary for carrying on the activity. The children found they needed help and practice in making change, and in addition and subtraction of large numbers. They had much experience in problem solving, an area in which they were weak.

Both teachers and pupils spent a daily period in the shop making materials for use in teaching and in learning arithmetic. The shop consultant and the consultant for the arithmetic workshop planned together for these periods.

At times the teachers in the course requested demonstrations by the consultant who worked with the children to illustrate methods, techniques, and the use of materials. The teachers then made appropriate adaptations of the methods demonstrated in working with their own group or individual child.

After the children left for the day, the teacher talked over the progress of the children, their needs as observed during the day, and made plans for further individual and group work.

WORKING WITH PARENT AND COMMUNITY GROUPS

The elementary supervisor serves parent and community groups by helping with parent workshops, speaking at parent-teachers meetings and parent study groups, and by working with community council and with other civic groups.

Parents make arithmetic materials—Parents who do woodwork as a hobby and who have the necessary equipment at home have helped to make some of the arithmetic materials the teacher needed for her work with children. Such materials are planned by the individual teacher or the staff and parents. Sometimes the teacher and children plan together the items that parents can help them to make. One teacher used a morning during American Education Week for parents and children to work on materials together in the classroom.

Following an explanation of her total program at Back-to-School Night, a teacher of first-year children expressed a need for some arithmetic materials. Parents immediately volunteered their services. Definite plans were made

and a date for a follow-up meeting was set. In the interim, the teacher gathered together samples of the materials she desired.

Since many teachers felt somewhat inadequate to describe the materials accurately to parents, the vocational arts supervisor came to the rescue and developed a series of drawings with detailed directions for construction so that a layman who was not acquaintd with the uses of a given gadget could understand the essentials of construction. The vocational arts department also prepared a sample of each item included in the booklet to be loaned to parent groups who were interested in preparing materials.

Parents learn about the arithmetic program—The elementary supervisor is frequently asked to give an interpretation of the total program in elementary arithmetic. What constitutes the program in general in each year of the child's elementary-school experience, how methods have changed, what results are achieved, and what parents can do to help are among the topics frequently covered.

Study groups are usually attended by a smaller group of parents who are interested in delving more deeply into topics of study. They wish to know if there is any foundation for the rumor that homework is frowned upon. What kinds of homework are acceptable? Are all children in a grade taught the same subject matter? What is done with the fifth- or sixth-grade pupil who does not know his multiplication tables? What types of supplementary arithmetic are provided for the intellectually superior child? What are the results on achievement tests of today's methods of instruction? Parents in study groups have also shown intense interest in the arithmetic kit and in the uses of materials contained in them, in a study of the arithmetic guide, in examining textbooks used by the children, and in seeing illustrations of children's work in arithmetic.

At both regular parent-teachers meetings and study groups, teachers explain or demonstrate their teaching procedures. One teacher described the organization in her classroom which allows for total group work at times, for also small group and individualized instruction as needed. She explains how she attempts to achieve a balance between the arithmetic which is a part of the social studies or science units and the arithmetic which must be taught in a sequential, logical manner. Another teacher demonstrates with children a kind of group interview technique by which she attempts to determine the level of the children's thinking and describes how she uses this information to plan next steps in the child's learning. Still another teacher shows children's work as she explains how concepts of fractions develop. The children have cut paper pie-plates to show fractional parts, used strips of a flannel board, cut pictures from magazines and estimated the fraction part shown or absent. The parents catch the teacher's enthusiasm in teaching and the children's obvious enjoyment in their learning experiences. All questions of a general

nature are handled in open meeting, but questions dealing with the progress of an individual child are postponed for more definite consideration at a conference with the parent or parents concerned.

The community learns about arithmetic—"But these new-fangled ways aren't teaching kids arithmetic. They can't add, substract, or multiply when they get on the job," claims the businessman who may be generalizing from a limited number of cases. He has a right to know the whole story, however; and it is the responsibility of educators to see that the problems he poses are explored, that reasons for existing conditions are understood, and workable steps in the direction of solutions are initiated. In Arlington County, the Community Council on Instruction, made up of representatives from the various organized community and parent groups, affords an opportunity for the community to learn about and to participate in the education of its children.

At each council meeting there is a general session at which members learn about the total instructional program, become acquainted with curriculum materials developed in the county, see demonstrations of methods of teaching in certain areas, and make plans for the study groups which are a part of each meeting of the council. During the current school year it has been requested that the teaching of arithmetic be considered at one or more of these general meetings.

Supervisors are often called upon to speak before community groups. The private nursery or kindergarten wishes to know about the first-year program in arithmetic and how their own readiness work in arithmetic may be integrated with it. A civic group wants to know: What children are learning in arithmetic today? Why and how the teaching of arithmetic has changed? What is the work of the elementary supervisor? How do the children in our county rank with children over the country in achievement?

The supervisor attends these meetings with facts and figures, courses of study, and other materials which will help to interpret the program to the parents and to answer specific questions. Such an experience affords an opportunity for learning on the part of the supervisor as well as the layman. Every concern of the layman is worthy of careful consideration to determine if it really points out an area of weakness. Even if it represents a difficulty of an individual child, it is essential that everything possible be done to assure that the child receives the necessary help to overcome his difficulties, or that material is better suited to his abilities.

SUMMARY STATEMENT

The elementary supervisor works for the improvement of instruction along with other areas of a general nature in the total instructional program. In achieving this goal the major portion of time is given to the teacher and

to the children in the classroom as she assists the teacher in the solution of instructional problems. Additional help is provided in the development of curriculum materials and in-service education. Finally, the supervisor's service to the community builds understanding among home, school, and community.

C. A MATHEMATICS SUPERVISOR LOOKS AT IN-SERVICE PROGRAMS

LAWRENCE W. LAVENGOOD

BEFORE launching into any in-service program involving groups of teachers, the existing educational philosophy upon which the particular school system operates should be examined. It is granted at the outset that the apparent philosophy of teachers often differs considerably from the stated philosophy of the administration. What goes on in the classroom is not always in conformity with general school policy. This irregularity happens generally because the individual teacher has not accepted the over-all school philosophy. And the non-conformity is due largely to the fact that teachers had little or no part in its formulation.

Since the purpose of a public school in the USA (tax supported and administered as a state function) is to support and maintain the democratic way of life which we cherish in America, and since democracy emphasizes the dignity and worth of the individual and seeks to promote his welfare and happiness, it behooves the school to be concerned with the individual—pupil, teacher, administrator, and tax-payer. The method of democracy places responsibility on the individual, working with others for the solution of problems which are common to the general welfare. It is assumed that, through a process of interaction of ideas of the people concerned, the most satisfactory rules of group living and working may be evolved.[1] Backed by this sort of philosophy, an in-service program has a good chance of success. At least, it would be off to a good start.

An acceptance of the foregoing would provide for a "bubbling up" as well as a "trickling down" of ideas, plans, and objectives. Respect and confidence must be two-way streets. Just as learning experiences are most effective when they are related to a purpose established by the learner, so it is with a school philosophy—it will be practiced to the degree that it was democratically established and accepted by the teaching personnel. Teachers, as well as pupils, need to develop a sense of belonging. In

[1] This paragraph adapted from *A Brief Statement of the Foundation for Curriculum Development*, by the Curriculum Council, Tulsa Public Schools, 1948.

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order to enter into the professional activities of the (mathematics) faculty with enthusiasm, teachers must feel wanted. They will then assume responsibility for contributing to the discussions and objectives of the group. In pooling and sharing information, ideas, methods, and plans, the resources of the individual are immeasurably enriched. This is one of the most fruitful facets of in-service growth.

ACADEMIC CONSIDERATIONS

The teacher with high academic credentials is not always the most successful teacher. The college student who enjoyed the enviable reputation of being a "brain" in mathematics is sometimes a miserable failure as a teacher of general mathematics in a secondary school. This failure may be attributed to one or more of several causes, among which are the following:

1. Failure to teach on the learning level of pupils
2. Lack of sympathy for the slow learner—a "take-it-or-leave-it" attitude
3. Failure to recognize individual differences
4. Making a fetish of high standards

Failure of teachers, regardless of academic prowess, may be attributed to still other causes, such as:

5. A cold, distant attitude
6. Failure to arouse interest
7. Failure to utilize the experiences and personal assets of individual pupils
8. Failure to learn the backgrounds, interests, and needs of the boys and girls
9. Failure to encourage pupils and to give praise for worth-while accomplishments

The argument is not against high scholastic achievement as a factor in the qualifications for a teacher of mathematics. On the contrary, it is highly in favor of scholastic success. But being an honor student, a Phi Beta Kappan, or the possessor of a doctor's degree in pure mathematics are not in themselves guarantees of success in teaching. A "natural" in the teaching of mathematics is one who has, in addition to sound scholarship, an understanding of boys and girls as growing human beings with varying aptitudes, interests, needs, and cultural backgrounds—one who can get down on the eye-level with the individual pupil and listen to his problems, his experiences, his likes and dislikes. The successful teacher is quick to encourage the feeblest signs of progress and never misses an opportunity to praise good work. These are some of the necessary (but not sufficient) ingredients in successful teaching. They are not inherent in a knowledge of the quadratic equation or the theorem of Pythagoras. These attributes of good teaching are a synthetic blending of personality, observation, and training. A well-organized in-service program could improve the last two of these three factors. There is no substitute under the sun for the first one, personality. It is a gift of the gods benevolently bestowed like sunshine and showers. Personality can, however, be enriched and mellowed through pleasant

environment and satisfying experiences. This sort of growth is what in-service group study can best promote.

PURPOSES

In order to overcome the deficiences in teaching inherent in the above causes of failure, an in-service program should be set up by the administrative staff. Small study-groups arranged geographically for the convenience of the teachers have been found effective in many places. In rural areas and small communities these group meetings might well be held in the evening after dinner or on Saturday, if not feasible immediately after school. In Chicago, "pilot" centers seem to be the best solution. "It is here that new teaching units are planned, and new teaching procedures are introduced and tested," quoting from *Educator's Dispatch* of December 1, 1953.

A major purpose of in-service education is to clarify the objectives for the secondary-school mathematics teachers. Aside from the usual objectives dealing with competence in the manipulative skills, the following purposes were introduced, discussed, and accepted by a recent study-group of junior high-school mathematics teachers in Tulsa:

1. Encouragement and practice in developing the spirit of inquiry and adventure in the study of mathematics and science
2. The growth of individual interest and competence in problem solving
3. A growing independence in thought and action in the learning process. A gradual weaning from teacher dependence
4. An appreciation and understanding of the increasing importance of a sound mathematical training as a prerequisite to many fields of endeavor
5. Thoroughness, accuracy, clear thinking, and persistence in dealing with problems, both mathematical and non-mathematical

These objectives are not always apparent in the minds of pupils nor in the purposes of teachers. They serve as an enrichment to the usual objectives inherent in the traditional presentation of mathematics. Without participation in formulating and acting upon these purposes and aims, the teachers involved would have given them only passive notice. But having a co-operative and personal interest in the accepted objectives, the members of this in-service panel have incorporated them in their teaching. Teachers not only gain in professional status by active participation in curriculum projects and other forms of in-service education, but they also prove to be good spreaders of the gospel to non-participants.

The importance of these humanizing values is summed up admirably by Dr. G. Edward Hall, President of the University of Western Ontario, in these words: "To me a teacher of mathematics who knows the history of mathematics, who has an understanding of mathematics, an insight into mathematics, and an interest in many things, including people, is a vastly superior secondary-school teacher to one who has taken specialized

course after specialized course leading to topology, metric differential geometry, the theory of functions, and the calculus."[2] Dr. Hall then poses the question as to whether it is more important for the mathematics teacher to be able to solve the probable error of a weighted mean or to be able to excite the curiosity of the high-school student through an understanding of the place of mathematics in society, to be able to gain the student's interest through real appreciation and understanding of what is being taught, and to be able to give of himself and of his personality.

Needless to say, the ideal teacher embodies both sides of these contrasting virtues. But in view of present and future shortages of teachers, the schoolrooms find themselves manned by teachers of varying qualifications. More and more mediocrity and even inferiority are found in the professional equipment of teachers. The best (if only partial) solution is in-service growth, promoted by well-organized local workshops. The in-service program must be systematically organized and conducted as democratically as feasible, but with the common understanding that all new teachers are expected to avail themselves of this opportunity for individual professional growth. There is enough know-how latent in almost any mathematics teaching staff, which, if properly pooled, discussed, demonstrated, and shared would raise the proficiency of teaching to the level of good teaching.

AVENUES OF APPROACH

1. *Pre-School Conferences*

Meetings of the new teachers of mathematics with the supervisor before the opening of school in the fall is a "must." The objectives of these early meetings should not be too ambitious but should be more in the nature of orientation. It has been found through experience that more good is accomplished when only the teachers new to their present assignments are included. New teachers are loath to open up and ask questions in the presence of older teachers. ("Older" is used here in the sense of tenure.) It works well to use one or more successful, experienced teachers, who feel at home, as resource persons in these discussion groups. The method is not to lecture and prescribe, but to encourage discussion, questions, and interchange of ideas. If the group is large, it is well to break up into smaller groups on a grade-level or subject basis. The optimum size of the most effective discussion group is arbitrary, but probably should not exceed twelve.

Certain routine matters like giving out courses of study, teacher's guides, desk copies of basic textbooks, and other teaching aids whose uses are optional are attended to at these pre-school meetings. An air of friendliness and good fellowship should prevail. Each individual new teacher should

[2] *Education Summary*, December 5, 1953.

be made to feel that he is now a full-fledged member of the local mathematics staff, that he has the confidence of the supervisor and the other teachers, and that he has freedom to work out his own teaching plans. He must feel that the supervisory staff is ready and willing to help but not to boss. At these meetings, which should continue for one to two hours per day for two or more days, individual appointments with the supervisor should be set up. Conferences with individual teachers should be informal and should be held before the opening of school or very early in the school year.

2. *Mathematics Council Meetings*

The secondary mathematics teachers in the public schools of Tulsa, Oklahoma, have an organization called the Tulsa Mathematics Council, affiliated with the National Council of Teachers of Mathematics. Besides the usual elective officers, there is a cabinet composed of representatives, one elected by each building group. This cabinet meets with the officers and plans the programs for four after-school meetings during the year.

Other meetings, in the nature of grade-level discussions, are planned by the council officers and cabinet members. These meetings are held at the different high-school buildings after school and as often as the teachers themselves determine. There is a leader and a recorder-reporter chosen by and for each group. The discussion groups are small enough that general participation is thereby encouraged. The topics for discussion are initiated by the teachers. This type of in-service is highly favored by teachers.

3. *In-Service Workshops*

One of the most effective means of improving the professional status of teachers is the curriculum workshop. The need for a segment of curriculum construction or revision is usually found through the group discussions mentioned above. If a sufficient number of teachers are interested in working out a curriculum project, they ask the supervisor to set up an organizational meeting. At this meeting the immediate objective is discussed and defined. The type of study is determined and the group effects an organization. The supervisor is a resource person. The time and place and length of meetings are determined and a schedule set up which is submitted to the director of curriculum for approval. The group decides whether or not they are to work for summer school credit. In this case, certain criteria must be met. In order to receive one hour of summer-school credit, twelve hours must be spent in the discussion workshop itself and a minimum number of hours spent on the outside in research and preparation. Absences must be made up and a few other requirements as to attendance and participation met. All members, however, do not need to enroll for summer-school credit in order for the in-service project to proceed. In addition, arrangements may be made by individual

teachers with Tulsa University for one hour of credit in the School of Education.

In the Tulsa schools, workshops of this nature have been very satisfactory to teachers as well as to the administration. At different times there have been workshops on each of the grade levels of junior high-school mathematics. In three instances the group set out to produce outlines in the nature of bibliographies that would assist teachers, especially new teachers, in the selection of suitable materials for the different ability levels of pupils. These outlines are currently in use and are proving helpful. Besides the outlines, a booklet of graded exercises on certain pre-determined topics was constructed. This booklet is furnished to pupils through the local school's fee fund. The booklets (one for each of grades seven, eight, nine) are in the nature of supplementary drill material not readily found in any one textbook.

Workshops have been organized to construct materials suitable for the slow learner; others, to produce exercises and materials to enrich instructional materials for the more advanced or gifted groups; still other groups have been organized for the purpose of improving the techniques of teaching arithmetic and general mathematics to the average and below average pupils. In these latter workshops considerable time is given to reports from individual teachers on methods and procedures in presenting some of the more difficult topics, skills, and procedures of arithmetic. The nature of these reports and discussions is determined by the members themselves.

The class demonstration has often been used as a practical means of showing teachers certain methods of presenting instructional material and also how to get a high percentage of pupil participation. These demonstrations need to be carefully planned and the teacher wisely chosen. The teachers meet in the classroom where the pupils and the teacher are at home. The situation is kept as natural as possible. The presence of visitors is an extraneous factor that can be more or less distracting if the demonstration is conducted by an inexperienced teacher.

Judging from the individual teacher evaluations of these workshops, the most good is derived from the interchange of ideas, methods, techniques and the good fellowship and better acquaintance of one with another. As a by-product of one of the recent workshops, a small booklet was compiled consisting of games, puzzles, and recreations appropriate for the various grade levels.

4. *Classroom Visitation*

A well-rounded in-service program should include classroom visitation by new teachers. Under this plan, the new teacher, relieved of teaching duties for a half day or whole day, visits a classroom either in his own building or some other building. He is not required to make any report. Usually, the

visiting teacher may go where he chooses, just so he visits classwork similar to his own. Sometimes it is wise for the principal or supervisor to suggest certain teachers to be visited. In this way, definite help can often be given for certain specific weaknesses. Observing a master teacher in active classroom situations is often more valuable for the new teacher than any other means of in-service education.

5. Other Means of In-Service Education

Space will not permit a detailed description of the following avenues of approach to better teaching; however, they must not be underrated. One of these is the conference period which is set up in the weekly schedule and enables teachers who teach the same pupil groups to discuss and solve common problems. This is especially effective in schools that have block schedules, core curriculums, "little schools," or other administrative organizations which keep groups of pupils intact through two or more subject areas, such as English, social studies, and mathematics.

Another means of in-service growth is the one-day state workshops sponsored and conducted in Oklahoma by the Oklahoma Education Association. Last year there were thirty-eight such workshops over the state. Mathematics teachers, like all others, profit from the association and fellowship with co-workers in their own and other fields.

There were three questions on the agenda of each of the thirty-eight one-day workshops for 1953. They had to do with school-community relations. The first question pertained to ways in which the schools can meet the criticism that the three R's are not being well taught. The second question related to the ways in which OEA local units can help interpret the school program to the public. The third question was concerned with public relations procedures connected with the promotion of good school legislation. Many of the teachers who commented on the question of how to improve the state workshop recommended that in the future the conferences be longer than one day and that they be organized on the basis of grade level and teaching field. This recommendation, if carried out, would better serve the mathematics teachers.

APPRAISAL

The effectiveness of each of the above avenues of approach to in-service growth is difficult to appraise, much less to measure. But the total effect is clearly on the positive side. Not all teachers benefited by some approaches. For instance, (speaking of the Tulsa situation), the more experienced teachers are not visited regularly by the supervisor. In view of the wide field (kindergarten to grade 12) and the large number of new and inexperienced teachers each year, the supervisor's services are given where most needed. Then, again,

comparatively few teachers can conveniently engage in a series of in-service meetings when conducted outside of school hours.

The evaluation of in-service education has been largely subjective. Expressions from teachers who have participated in after-school workshops have been highly gratifying. Suggestions and criticisms are solicited by the supervisor and submitted by the members of the in-service groups. These comments are valuable aids in modifying and improving the in-service program. Here are some typical comments:

1. This curriculum work has helped me to familiarize myself with the broad subject matter field.

2. It has enabled me to organize the subject matter.

3. It has broadened my scope of methods and procedures.

4. It has helped me to collect materials for study. The organization of problem materials into small teaching and testing units enables the teacher to have materials on hand which are suitable for all types of learners.

5. Exchanging views and getting better acquainted with co-workers add interest.

6. Classroom visits and conferences with our mathematics supervisor have been most interesting, gratifying, and inspiring to me.

7. Setting up goals to strive for has been inspirational.

8. Checking up to see how far we fall short of achieving some of the goals mentioned is challenging to us.

9. A close personal relationship with a supervisor was very important to me when I began teaching in Tulsa, and has continued to be of great value through the years I have taught here.

10. The industrial visits of the council have been of particular interest to me. This type of activity has helped to reveal some of the many and varied uses of mathematics in our world.

11. Group meetings help to solve problems common to all of us. We can discuss learning situations that are related to other activities in our building.

12. Although I haven't participated in in-service groups, I feel that I have benefited through the efforts of others who have worked on in-service programs through reports and printed materials which have come out of such programs.

13. The general opinion, of all the teachers here, is that the greatest benefits have been realized from the course-outlines for each grade, and tests and worksheets developed by the in-service groups. The new teachers at our building were particularly high in their praise of these supplementary materials.

14. The teachers here feel there is a need for a suitable evaluation program. This might be a topic of worth-while discussion for some group in an in-service program.

One of Tulsa's high-school principals reports: "The faculty meets two mornings per week to discuss total school problems. The mathematics teachers have much to contribute in considering these problems and in establishing policies and practices. The teachers consider problems of curriculum, nature of learning, classroom techniques, evaluation, marking and recording, and all the related problems which seem to harass the teachers. I think the mathematics teachers profit from this experience if no more than first to discover that in their misery they have company. The reports of the teachers working in block schedule and senior core and the interaction of those teachers in our faculty

meetings should promote the in-service growth of mathematics teachers not only in terms of their growth in knowledge of subject matter, but also in areas of human relations, classroom techniques, *etc!*"

More objective measures are needed to help evaluate the total effectiveness as well as the progress of in-service programs. A study[3] now being made in Tulsa lists seven major criteria for evaluating the effectiveness of in-service education group-study. The criteria are listed below:

1. The working plan of the work group should be such that an *environment* is created which is *conducive to democratic co-operation* of all those concerned with the solution of the problem under study.
2. The work group should have the *guidance of democratic leadership.*
3. The *motivation* of the participants for working with a group should come from a feeling of need by each individual.
4. The program and methods of work for the group should be *co-operatively* planned and developed.
5. The program of work of the group should provide for an *interpretation* to other persons who may be concerned with the purposes and the outcomes of the work of the group.
6. The program of work should provide a plan for the *continuous evaluation and improvement* of the effectiveness of the work of the group.
7. *Resources* should be used which will facilitate the work of the group.

Each of the seven general criteria is broken down into from six to eleven specific characteristics. This material was submitted to over 200 key educators in the field of curriculum in all the states of the Union, asking that each of the 63 items be checked as to acceptance or rejection. Responses have been received from 45 states. From the criteria developed and accepted through this study, a checking device will be constructed which can be used for self-analysis and the evaluation of the effectiveness of in-service projects. Such a score card should be of considerable value in collecting objective data for the evaluation of future in-service programs.

CONCLUSION

The need for in-service education should be based on the premise that changes must take place in people as well as in courses of study. It is more in the realm of spirit than matter. The block-schedule, the core curriculum, the use of interest groups, and other organizational devices will have little effect on the learning processes in mathematics unless the classroom teacher is able to put the breath of life into the program.

Human relations, good or bad, is the most potent factor in the success or failure of a teacher. Too often, in-service programs are set up to improve almost everything in mathematics but the teacher. Human values are the heart and soul of pupil-teacher relationships and should not be slighted in

[3] A study of "Criteria for Evaluating the Effectiveness of In-Service Education Groups in Curriculum Development," by Byron L. Shepherd, Assistant Superintendent for Secondary Schools.

any program whose objective is to improve the learning processes and to develop success in teaching. Mathematical growth is induced more abundantly in a favorable climate. It is warmth that makes the tea-kettle sing and the jonquil bulb come to life. Continuous in-service growth is the price of success for the mathematics teacher.

D. THE CONTRIBUTION OF PROFESSIONAL ORGANIZATIONS

MARIE S. WILCOX

AT A recent meeting of a state mathematics organization, a young man was asked to tell his reasons for joining the National Council of Teachers of Mathematics. "You teachers who have taught a few years don't have much money," he said, "but those of us who are just starting to teach just don't have any. It was definitely from the grocery fund that I took the money to join the National Council of Teachers of Mathematics, but that first issue of the *Journal* was worth the entire price of membership. Many of you teach in large schools or large school systems in which there are many teachers of mathematics with whom you may discuss your problems. I am the only teacher of mathematics in our town. I don't have anyone with whom to talk over methods or from whom to get assistance. I have to count on meetings like this and that little magazine to help me."

Many teachers, in a school system too small to have an in-service training program and possibly not paying enough in salaries to expect the teachers to attend summer sessions or workshops held in connection with a college or university, look to professional organizations for assistance. On the other hand, consider an elementary-school principal in a large system which has both voluntary workshops for teachers, scheduled on week ends or during holiday periods, and workshops on school time at which attendance is compulsory. When asked by a friend whether she would attend the voluntary workshop the following summer, she replied that she would not attend. She said that she had participated in so many of the local study groups that she felt that she was always talking over the same problems with the same people. She planned to attend the meetings of two large national professional organizations that next summer, and then to spend much of the remainder of the summer assisting with a publication for one of them. She was not critical of the local workshop program. As a matter of fact, she had assisted with it since its inception. She realized that some teachers could not or would not attend other professional meetings, and that some problems

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could best be discussed at the local level. However, she felt the need of a broader view on current educational practices, an opportunity to make new contacts, and the inspiration derived from a meeting attended by teachers from all parts of the country.

Many teachers belong to professional organizations primarily to receive the publications of the group. "That little magazine" to which the young man referred, along with the journals of other professional organizations, is one of the important media for in-service training. Not only do these publications contain articles of current interest, but also most journals include book reviews and bibliographies of material available on certain topics so that the educator who seeks additional information by reading is assisted in planning that reading. Many organizations also publish yearbooks and pamphlets or other small publications. A teacher will probably choose to belong to some organizations concerned with education in general and some concerned with particular subject matter in order to be served best by the publications of the groups.

In a large school or school system, the school library may subscribe to a number of professional journals and make them available to members of the staff. Staff members having this opportunity would want to make use of it. In general, however, the successful teacher will desire to hold membership in certain organizations so that the journals which are regularly most helpful will be available when there is the time and inclination to read them, available for reference later as the occasion arises, and readily available when it is desirable to use them in the classroom.

Attendance at the meeting of a professional organization serves several purposes. One is certainly to hear the several papers read by authorities in the field. Another is to hear and possibly participate in discussion groups. Although a national organization can offer a long list of prominent speakers, many teachers can only hope to attend meetings of national organizations when the meetings are in their vicinity. Regional, state, and local meetings of professional organizations are available to a larger number of their members. These meetings usually feature one or more speakers from other parts of the country, make use of local speakers, and give members an opportunity to participate in discussions. One state mathematics organization not only arranges an annual meeting with a rather formal program, but is this year arranging county meetings, particularly in counties with no large cities, which will have no pre-arranged programs at all. Members who care to attend will decide the topics they care to discuss and form their own discussion group or groups. In one section of the state such meetings have been held and found popular. Although the teachers who attend these local meetings could have arranged to have lunch together at the county seat and have a discussion of educational problems of particular interest

to them, probably no one of them would have taken the initiative in arranging the meeting. The role of the professional organization in this case is simply to set the machinery in motion to arrange these small local discussion groups.

Displays of new books, films, and other teaching aids are regularly a feature of regional and national meetings of a professional group. Frequently there are also exhibits of unusual student projects. A careful inspection of these is another "must" for members who desire the greatest benefit from such a convention.

In addition to profiting from the message of the speakers, the participation in discussion groups, and the acquaintance with new educational materials at the meeting of a professional group, the teacher has an opportunity to meet and talk informally with teachers from other localities. In informal discussions between sessions, before or after committee meetings, or at the luncheon or banquet table, one often gets the best new teaching ideas. It may be that a teacher just gains self-confidence when it is found that someone whose judgment is respected has a philosophy or is using methods similar to her own.

Membership in professional organizations, accompanied by the reading of the publications and attending the meetings of these groups, does not take the place of other types of in-service training for teachers but supplements all of them. The teacher who keeps informed on new developments through professional literature and meetings is a more valuable member of a local discussion group or committee. One also contributes more in a summer workshop, and is better able to profit by advanced study. In addition one takes greater pride in the profession by having associated with other members of fine professional organizations and is, therefore, stimulated to a desire for further professional growth.

E. SUMMER INSTITUTES FOR MATHEMATICS TEACHERS

FRANCIS G. LANKFORD, JR.

IN RECENT years many mathematics teachers have learned that a week or two spent at a summer institute can be very profitable and a lot of fun. Across the country—from Virginia and New Jersey to California and Oregon—institutes for mathematics teachers were held at numerous places during the summer of 1953. Although these institutions varied considerably in the details of their programs, their purposes were everywhere similar. Those who have planned an institute for mathematics teachers have clearly recognized that the field of mathematics has undergone highly significant developments

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in the years since the outset of World War II. At the higher levels these developments made enormous contributions to the war effort; and, in our current concern with building an impregnable defense against aggressors, the new field of pure mathematics is proving to be an indispensable ally of the research worker. Then there are countless new users of mathematics in business, science, industry, and government. The programs of summer institutes for mathematics teachers have been dedicated to the job of helping teachers of mathematics become aware of the virile growth of their field and its new significance in this day when every major advance in science and technology is greeted with two hopes: will it help secure peace and will it help provide a more abundant life everywhere in the world?

There is another dominant purpose of institutes for mathematics teachers. The field of mathematics and its applications cannot be exploited for the education of young men and women through a steady diet of the old emphasis on computational techniques. The newer psychology of learning has been interpreted to mean for the mathematics teacher greater attention to the concepts or ideas of mathematics. This is not merely a "new look" for an earlier psychology of mental discipline. Instead, insights into the meanings of the basic ideas of mathematics are regarded as the only dependable goals for the teacher who seeks competence in mathematics—regardless of whether or not any magical, general "sharpening of the mind" results. Programs of institutes for mathematics teachers have also been designed with this second purpose in mind. Teachers who have attended have not only learned what balance should be maintained between even building skills in computation and the development of insights into ideas, they have also acquired a new confidence in themselves to promote changes back home designed to maintain this balance.

STUDY GROUPS

A variety of activities has been used to realize the purposes of institutes for mathematics teachers. Among those which teachers regard most favorably are the informal study groups or discussion groups. In these, little use is made of lectures. Instead, teachers exchange ideas and describe their experiences in handling some particular aspect of their jobs as mathematics teachers. For example, one study group may deal with ways and means of identifying and developing pupils gifted in mathematics. The characteristics of such pupils may be reviewed and content topics which can be successfully used with these brighter pupils but which are inappropriate for less able pupils are carefully examined. Some of these study groups deal with the daily concerns of teachers in teaching a particular subject such as general mathematics, algebra, or geometry. One such group dealing with general mathematics might deal with such questions as "How can we best arrange for

re-development of basic ideas of arithmetic in a general mathematics course?" or "What are the advantages and limitations of the so-called laboratory method for teaching some of the basic ideas of mathematics?" Some institute study groups prepare written summaries of the helps accumulated which members take back home to refer to again and again. When study groups operate at their best, there is ready willingness of members to describe an experience in teaching of mathematics with an invitation to the others present to analyze it, to suggest modifications, or to select points that may be used by them. Many of the readers of this account of the work of institutes for mathematics teachers will have participated in workshops of one sort or another. They will recognize that mathematics institute study groups have simply adopted the effective, informal "workshop way of learning."

CONCRETE TEACHING AIDS

For a long time the mathematics teachers looked enviously at the equipment in the science teacher's laboratory or at the charts, maps, and films used by the social studies teacher. Now many mathematics teachers have their own equipment for making mathematics both interesting and meaningful to young students. No longer is a single book in the hands of teacher and pupils regarded as adequate equipment for the modern mathematics teacher. Moreover, this lesson has been learned mainly in "institutes," "workshops," or "laboratories" which mathematics teachers have attended in recent years. Not all of those have been held in the summer. Some have been held on Saturday mornings during the school session and teachers have driven many miles to learn how to make a hypsometer, a home-made transit, models illustrating theorems in plane geometry, a device for representing graphically the properties of directed numbers, or a flannel board on which teachers may help pupils see formulas for plane figures evolve with meaning. These laboratories have been very popular features of institutes for mathematics teachers and in some instances have occupied most of the time of those who attend. Not only have models and other teaching aids been made in these laboratories, but slides, filmstrips, and calculating instruments have also been studied as well as instruments—both historical and modern—for making direct and indirect measurements. Films on mathematics are examined and critically evaluated, for mathematics teachers have learned that some such films are only expensive and troublesome substitutes for the blackboard and are no more effective as aids to learning. Others they regard as very helpful, indeed. Often in these laboratories are displayed the many booklets, charts, and tables which manufacturers are eager to supply to the mathematics teacher without cost. Included among these will be charts showing decimal and common fraction equivalents, booklets on the history of our number system or on the history of measurement. There will also

be booklets with guidance value giving a pupil reasons why he should study mathematics in terms of the fields of human endeavor that demand competence in this field. There may be a collection of courses of study on display showing what other school systems have planned in mathematics, and there may be a collection of new mathematics textbooks as well as books of a supplementary nature suitable for school libraries. All of these "aids" for the mathematics teacher are intended to help him make mathematics come alive and stimulate interest and understanding in the minds of alert adolescents.

APPLICATIONS IN INDUSTRY, SCIENCE, AND GOVERNMENT

Many representatives of fields which make extensive applications of mathematics have been featured on the programs of institutes for mathematics teachers. Their lectures, based on firsthand acquaintance with the uses made of mathematics in the fields represented, have helped teachers to supplement conventional content with numerous interesting applications. There have been lectures on "Mathematical Applications to the Biological Sciences," "Mathematics and Astronomy," "Mathematics in the Building Trades," "Electronic Computers," "Statistical Quality Control," "Mathematics in Aircraft Research," "Aerial Map-Making," "Mathematics in Shipbuilding," the "Mathematics of Insurance," and many others.

These lectures from fields of applied mathematics have not only helped teachers learn about applications which they can use to enrich the content of their courses but they have also had a distinct guidance value. Teachers have acquired firsthand evidence of the importance of the field of mathematics. This evidence they can transmit to their pupils with authoritative documentation. Moreover, mathematics teachers attending institutes gain reinforced confidence in the work they do when, for example, an official of the General Electric Corporation or of Du Pont tells them how our scientific and industrial progress depends on mathematics. In addition to the lectures, teachers have an opportunity to visit with these representatives of industry, government, and science at mealtime and at social occasions. They learn how great the need is for more persons well trained in mathematics. This new view of the importance of their work sends mathematics teachers back to their classrooms with fresh enthusiasm and a firm determination to make their teaching more alive and more challenging to capable young minds. Incidentally, one of the encouraging aspects of the job of planning programs for mathematics institutes is the ready willingness on the part of high officials in business and government to co-operate. In many instances they seem delighted at the opportunity to participate in this practical in-service education of teachers. They seem to be motivated by a desire to help in the up-grading of our educational effort rather than by any desire to promote their company's interest directly.

FUN AND FELLOWSHIP

By no means an insignificant by-product of attendance at institutes for mathematics teachers is the fun and fellowship participants experience. One of the earliest institutes for mathematics teachers was, until a year ago, held annually at Duke University under the direction of Professor W. W. Rankin. Year after year some mathematics teachers returned to this institute to enjoy the social occasions and to meet old friends as well as to profit from lectures and discussion groups. This has been true in other institutes. Christmas cards and pictures taken at the institutes are exchanged from many points in the country. Attendance at national meetings is eagerly anticipated because of the opportunity afforded to visit with friends met last summer at an institute. Indeed, it can probably be correctly claimed that professional meetings at home and at national meetings are attended more often, after a teacher has been at a summer institute. Moreover, teachers who attend summer institutes for mathematics teachers are more active in their professional groups—participating on committees, appearing on convention programs, and contributing articles to magazines. This fun, fellowship, and professional stimulation comes in large part from the teas, group singing, watermelon parties, and country dinners that feature institutes for mathematics teachers.

It must be recognized that institutes for mathematics teachers as they have been planned and carried on at many institutions can only supplement the more formal preparation of mathematics teachers through conventional courses —both content and professional. It requires a sound background in such work and some firsthand experience in teaching pupils for a teacher to gain much profit from an institute. The popularity of such institutes with capable and experienced teachers is clear evidence, however, of their value as a supplement to more formal study.

BEST BOOKS OF 1953 ON VOCATIONAL GUIDANCE

ROBERT HOPPOCK

EACH year the author of this article undertakes to review all new books on vocational guidance, except those devoted primarily to occupational information, which are revised in the Occupational Index. The best of the books dealing with the theory and practice of vocational guidance are annotated in an annual list; this is it. Included are some earlier references which did not reach the author in time to be included in the 1952 list.

Inclusion of a book in this list does not mean that it is considered infallible. It does mean that it has been campared with other publications and considered to contain useful information that would be of interest to readers who try to keep up to date on the better literature in this field. Apologies are made in advance to authors and publishers whose books have not been included and to those who find the annotations inadequate.

ARBUCKLE, D. S. *Student Personnel Services in Higher Education.* New York: McGraw-Hill Book Co. 1953. 352 pages. $4.75. Evaluation, organization, and administration. Admission, orientation, and counseling. Teaching. Vocational, religious, health, housing and dining services. Student aid and student group activities. Rogerian philosophy. Numerous examples. Readable.

BENNETT, M. E. *College and Life.* Fourth edition. New York: McGraw-Hill Book Co. 1952. 457 pages. $4.50. An orientation text for college freshmen. Includes a twenty-six page chapter on vocational and avocational planning.

COHEN, N. M. *Vocational Training Directory of the United States.* 1953. Washington 9, D. C.: Nathan M. Cohen, 1434 Harvard St., N. W. 138 pages. $2.25. A guide to 3,900 approved, private, non-degree vocational schools. Includes technical schools but not junior colleges. "To be listed does not designate recommendation."

CROMWELL, R. F.; HATCH, R. N.; and PARMENTER, M. D. OCCUPATIONS COURSE. Unit 1, *You and Your Future;* Unit 3, *Success in the World of Work.* Revised editions. Buffalo 1: Guidance Publishing Co., Box 27, Niagara Square Station. 1953. 56 pages. Text-notebook units for the high-school course in occupations. More than the usual amount of interesting material. Many good quotations. Suggested assignments will not appeal to all teachers, but nearly every teacher will find a few usable ideas. Accompanied by 16-page *Teacher's Manual.*

HAMRIN, S. A. *Initiating and Administering Guidance Services.* Bloomington, Illinois: McKnight and McKnight. 1953. 220 pages. $3.00. For school administrators who want to know how to start a guidance program, and how to enlist the interest and support of the faculty and the public. Examples from elementary and secondary schools.

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HAVEMANN, E., and WEST, P. S. *They Went to College.* New York: Harcourt, Brace and Co. 1952. 277 pages. $4.00. A fascinating report on a follow-up of 9064 graduates of 1037 colleges. Includes comparative data on earnings in different occupations. Excerpts from replies add human interest.

HILTON, M. E., editor. *Guide to Guidance.* Volume XV. Syracuse, N. Y.: Syracuse University Press. 42 pages. Annotated bibliography of 1952 books, pamphlets, and journal articles on all aspects of guidance and student personnel work.

HYMES, JR., J. L. *Effective Home-School Relations.* New York: Prentice-Hall. 1953. 264 pages. $4.65. Any counselor, teacher, or administrator who wants to know why parents do some of the queer things they do should read this book. Clear, convincing, and sometimes entertaining explanations of the parental point of view and what the schools can do about it. Profuse references to other sources. Practical suggestions. Good material.

JONES, T. S. *Your Opportunity 1952-53.* Milton 87, Mass.: Theodore S. Jones, 1952. 222 pages. $3.95 in paper binding, $4.95 in cloth. An annual catalog of fellowships, scholarships, awards, loan funds, prizes, and competitions.

KNAPP, R. H. *Practical Guidance Methods for Counselors, Teachers and Administrators.* New York: McGraw-Hill Book Co. 1953. 360 pages. $4.75. Learning the guidance needs of students in elementary and secondary schools. Helping students individually and in groups. Vocational guidance; grouping techniques; guiding the progress of students through school; health needs; slow learners; gifted pupils; and pupils with special needs.

LITTLE, W., and CHAPMAN, A. L. *Developmental Guidance in Secondary School.* New York: McGraw-Hill Book Co. 1953. 324 pages. $4.50. A textbook for teachers and counselors who wish first to understand the problems of students and then to consider what can be done to help them. "Emphasis is shifted from the form and structure of a guidance program . . . to the subject of boys and girls." Based on an analysis of 19,006 problems stated by 4,957 students in 45 high schools in 10 states.

McGEHEE, F. *Please Excuse Johnny.* New York: Macmillan Co. 1952. 242 pages. $3.50. Fascinating anecdotes from the experience of a "hookey cop." Real life situations, full of human interest, with occasional bits of humor and more than a dash of sex. Painless way to learn about the kinds of home life with which some truants have to contend. No specific mention of vocational guidance, but every counselor should read it.

MUNSON, H. L. *The Counselor's Handbook for Sources of Occupational Information.* Williamson, N. Y.: H. L. Munson, Box 491. 1953. 56 pages. $1.25. List of 307 sources including "commercial publishers, schools and colleges, films and filmstrips, professional organizations and industries, government agencies, and periodicals." Cross-indexed by occupation.

MYERS, G. E.; LITTLE, G. M.; and ROBINSON, S. A. *Planning Your Future.* Fourth edition. New York: McGraw-Hill Book Co. 1953. 526 pages. $3.60. Textbook for a high-school course in occupations. Intended to start pupils thinking about educational and vocational plans and to develop an appreciation of work. About 200 pages of occupational information, by census classification; and 300 pages on related topics including: how to survey local opportunities for graduates and drop-outs, finding a job, self-employment, labor-management relations, working conditions, and working laws.

1953 Supplement to the 1951 Directory of Vocational Counseling Agencies. Washington 5, D. C.: American Personnel and Guidance Association. 1534 O St., 1953. 32

pages. 50c. Agencies approved by the Committee on Professional Practices of the Association.

PROSSER, C. A., and SIFFERD, C. S. *Selecting an Occupation.* Bloomington, Illinois: McKnight and McKnight Publishing Co. 1953. 246 pages. $2.50. Ten chapters based on the *Occupational Outlook Handbook;* ten on how to choose and get a job; reprint of New York State Employment Service material on why young people fail to get and hold jobs; two chapters on reading, spelling, and writing.

RECTENWALD, L. N. *Guidance and Counseling with Psychometric Practices.* Washington, D. C.: Catholic University of America Press. 1953. 192 pp. $3.25. The nature of the problem; some fundamental concepts in guidance and counseling; background information; standardized tests and inventories; psychometric practices and statistical techniques; information about education; information about occupations; counseling fundamentals; counseling aids; evaluation; organization.

SARGENT, F. P. *Handbook of Private Schools.* Boston, Mass.: Porter Sargent, 1952. 988 pages. $8.00. Brief descriptions of 1,200 elementary and secondary schools, junior colleges, and other schools which offer specialized training; *e.g.,* in art, music drama, dance, business and secretarial work, mechanics, physical therapy, *etc.* Arranged geographically and cross indexed by type.

SMALL, L. *Personality Determinants of Vocational Choice.* Psychological Monograph No. 351. Washington 6, D. C.: American Psychological Association, 1333 16 St., N. W. 1953. 21 pages. $1.00. Comparison of 50 maladjusted adolescent boys with 50 better adjusted boys. The latter made more realistic choices. Evidence support's Ginzberg's theory of compromises between fantasy and reality, but contradicts his theory of developmental progression toward greater realism.

TUCKMAN, J., and LORGE, I. *Retirement and the Industrial Worker, Prospect and Reality.* New York: Bureau of Publications, Teachers College, Columbia University, 1953. 105 pages. $2.75. Attitudes toward retirement of 660 male and female unionized cloakmakers in the New York City area, fifty-five years of age and older, including 240 already retired on union pensions. "Retirement tends to look less attractive as the worker grows older."

WOOLF, M. D., and WOOLF, J. A. *The Student Personnel Program.* New York: McGraw-Hill Book Co. 1953. 416 pages. $5.00. Counseling, group work, student government, extraclass activities, housing, discipline, remedial services, measurement, orientation, faculty advising, counselor training and administration in high school and college. Vocational guidance and placement are mentioned in the chapters on measurement and on counselor training.

ZERAN, F. R. *Life Adjustment Education in Action.* New York 16: Chartwell House, Inc. 1953. 541 pages. $6.50. A symposium on the objectives of life adjustment education and the ways in which they may be reached through the conventional school subjects, and on the relationships of life adjustment education to elementary and secondary education, the community, the curriculum, guidance, work experience, instructional materials, and adult education.

ZIMMERMAN, O. T., and LAVINE, I. *College Placement Directory.* Dover, N. H.: Industrial Research Service. 1953. 431 pages. $10.75. Companies which employ college graduates, indexed by jobs they offer and by state. Number of graduates employed annually, and whom to contact. Other data. Colleges arranged by states, with names of placement officers. Incomplete but useful.

The Book Column

Professional Books

AMERICAN ASSOCIATION OF SCHOOL ADMINISTRATORS. *Educating for American Citizenship*. Washington 6, D. C.: The Association, 1201 16th St., N. W. 1954. 615 pp. $5. The authors, a commission of nine prominent educators including school superintendents, professors of education, a classroom teacher, and a principal, voice concern over threats from isms without and civic apathy within on important issues of the day. The purpose of this 32nd Yearbook, according to the commission, is to survey existing practices in citizenship education to see where they might be improved.

Concluding that a good school curriculum cannot avoid touching upon controversial issues if it wants to give students experiences in contemporary affairs, the commission says the question is not whether children should hear and talk about controversial issues. "No school," it goes on, "can prevent youth from hearing about such issues in their daily lives. The question to be decided is: Should their contacts with controversial issues be limited to experiences outside the school—or should they meet such issues in school where they may learn to handle them? Youth will meet them sooner or later. Hence it seems far more appropriate to include them in the curriculum as natural, normal aspects of life about which youth must learn."

Pointing out that "we cannot fight totalitarian ideologies without understanding them, and that to understand them, we must read what their adherents say, argue their faults and merits, and know their strategy and their great weaknesses," the commission says it is important for young people to have access to books and materials dealing with communism. But, it warns, "If such materials are on the shelves of school libraries, they must be labeled clearly to indicate their communist bias." The commission further calls for well-trained, emotionally mature teachers who can guide classroom discussion of controversial issues with evenhanded impartiality.

Declaring that education for citizenship really is a community problem and that the school is only one of the forces determining the quality of citizenship, the authors suggest mobilizing and co-ordinating efforts of school personnel, parents, community agencies, service clubs, women's organizations, communications media and "unorganized persons" to develop a communitywide program of citizenship training. They warn: "Until communities are willing to endeavor to make all aspects of community life touched by children and youth be good for them, they need not be surprised, if even with a good school program of civic education, their older youth are not as good citizens as they hoped they would be."

When community and school work together on citizenship, the commission maintains, the school child is helped to function more effectively and intelligently in his "seven circles of citizenship"—family, school, neighborhood, town, state, country, and world. Too often, the commission observes, citizenship is not considered something which should be "taught." It is easy for laymen and even teachers themselves, according to the authors, to assume that "most people with an education are better citizens than they would have been if uneducated, and hence all that is necessary to do is to keep children and youth in school as regularly and as long as possible." "They have come to see," the authors continue, "that being a good citizen has to be taught just as specifically and directly as being a good typist or a good doctor. Merely being in attendance or even getting good school marks in a variety of subjects is no guarantee that the needed level of civic competence is being attained." The commission outlines a well-planned citizenship program as one that provides the following:

1. Schools give pupils thorough instruction in the American heritage, stressing primarily the fields of history, geography, civics, sociology, economics, and related social studies. Here, and in other courses and school activities, the student becomes well-informed about the origin and meaning of American government, its institutions and the ideals of justice and liberty that self-government makes possible.

2. Schools strive to build American ideals and democratic attitudes. Commenting that "democracy has been slower than dictatorship to put the emotions to work creating favorable attitudes toward its principles and ideals," the commission lists some ways whereby favorable attitudes are created in school: by the teacher's own practice of good citizenship; by the democratic tone or climate of the classroom; by giving students opportunity to develop desirable good group standards; and by direct teaching of patriotic ideals through the constructive use of musical and dramatic arts, pageantry and emotional appeal.

3. Schools give students training in defining problems, working on them, and solving them. Schools help students to locate, classify, appraise, and compare information in order to reach independent opinions.

4. Schools give students practice in active school-community service to reinforce what they have learned. Here the commission cites examples of pupils undertaking projects to get out the vote on election day, clear up traffic hazards, beautify school grounds, cut down Halloween vandalism.

As a guide to communities who would evaluate their program of citizenship education, the commission poses eleven key questions. It further discusses five current or recently completed major studies in the field of citizenship education which illustrate difference approaches being used. The studies cited include the Detroit Citizenship Education Study; the Citizenship Education Conference of Syracuse University, Syracuse, New York; the Kansas Study of Education for Citizenship; the Civic Education Project of the Civic Education Foundation, Cambridge, Massachusetts; and the Citizenship Education Project of Teachers College, Columbia University, New York City. The book also contains a roster of members of the AASA as of October 15, 1953, and an index.

ASHEIM, LESTER, editor. *The Core of Education for Librarianship.* Chicago 11: American Library Assn., 50 E. Huron St. 1954. 80 pp. Paperbound. $1.50. This is a report of a workshop held under the auspices of the Graduate Library School, University of Chicago. The book discusses the importance of a single central core of information and knowledge to librarianship as a profession. It describes, as a suggested framework, the areas of a core program: the library in society, professionalism, materials, services, administration, communication, and research. With these core areas in mind it considers the problems facing library schools, the library field, and both jointly. Throughout, emphasis is on the librarian as a liberally educated individual as well as a professionally trained one. Appendices include areas of core curriculums recommended by individual workshop committees and characteristics of professional librarianship.

BLAIR, G. M.; JONES, R. S.; and SIMPSON, R. H. *Educational Psychology.* New York 11: Macmillan Co. 1954. 619 pp. $4.75. The present book has been written in an effort to supply teachers and prospective teachers with those facts and principles and methods of procedure which have maximal usefulness in the classroom and in other educational situations. The materials have been fathered from many sources including the psychology laboratory, classroom experimentation, clinical experience, and from such related fields as cultural anthropology, psychiatry, biology, and sociology. It is the plan of the book first to present a longitudinal view of the child as he progresses toward maturity; secondly, to show forces which influence and produce change in the child's learning and adjustment; thirdly, to illustrate how the methods and tools of

psychology can be used to evaluate the effectiveness of the educational program; and finally, to discuss some of the psychological factors which influence the professional growth and mental health of the teacher. The book has a developmental emphasis throughout and is particularly oriented in terms of the needs of children and the forces which motivate them to learn and adjust. A feature of the book is the effort which has been made to illustrate psychological theories by using actual classroom examples so that teachers may gain clear insight into the fundamental values which psychology has to offer. Also of a unique nature is the section dealing with the psychology of the teacher. Books in the past have frequently given the impression that all one needs in order to teach is to understand children. Recently, however, an awareness has developed that to be effective the teacher must know himself—be able to diagnose his own assets and liabilities, his own personality, and his own teaching methods. Hence much attention has been given to the teacher's role in the learning process and to the nature of teacher-pupil relationships.

COLE, LUELLA. *Psychology of Adolescence*. Fourth edition. New York 16: Rinehart and Co. 1954. 728 pp. $6. The author in preparing this revised book states that she was guided by three general principles in selecting and presenting the materials. First she presents a balanced and comprehensive picture of adolescent growth along all lines—physical, emotional, social, moral, and intellectual. Naturally, the published reports of research in these various phases of adoescent development are not equal in number, scope, or value; but within the limits imposed by the available studies, she has given equal emphasis to growth in each field. Second, she has considered the usefulness of each study for prospective teachers, teachers in service, parents of adolescents, and the adolescents themselves in order that the material may be of the greatest value to these various groups of readers. Special emphasis has been given to those research studies that contribute most to the problems of daily life in the school, the home, and the community. Third, she uses many histories, anecdotes, personal reminiscences, figures, and other illustrative materials, not only to make the text of greater interest to the student but also to facilitate the application of what is learned to the daily life of adolescent boys and girls. The present revision differs from its predecessors in the substitution of more recent or more complete studies for such reports as have become outdated, in the inclusion of more interpretation of the data—and especially of a more psychoanalytic interpretation—and in the emphasis upon material from recent studies in personality and sociometry. In response to modern interest in personality, she has added a chapter on the topic. The list of novels illustrating problems of growth and possible solutions—good and bad—to these problems has been revised and brought up to date. The references to the periodical literature at the end of the chapters have been grouped into topics instead of being listed alphabetically, in order that the lists may provide more guidance than before and may also be used for the initial readings needed for term papers or reports.

COOK, LLOYD and ELAINE. *Intergroup Education*. New York 36: McGraw-Hill Book Co. 1954. 408 pp. $5.50. Here is a survey of the field of intergroup relations organized to assist the student and professional educator in his school and community work. The prime foci are race, creed, national origins (or immigrant cultures), and social class. The authors are concerned not only with the minority-majority relations of social groups, but also with the tensions which exist within and between these groups. Concrete problem cases are presented for study and analysis, and an attempt is made to solve them in the light of situational facts and democratic values. Concerned with the task of educating for better intergroup relations, the book is developed around the principle that student learning falls into four interrelated areas. The first is knowledge content, a factual understanding of minority-majority relations in our society and of the functions

and effects of race, creed, *etc.* in child life. The second area is democratic values, the rights, duties, and ideals affirmed by our society, and used here as the moral pivots on which study-action should turn in resolving intergroup and interpersonal conflicts. The third area involves skills in making studies and in guiding change processes, and the fourth area imparts the principles of good judgment, the development of the ability to estimate cause-effect-cause sequences.

Criteria for Evaluating Junior High School. (Preliminary Statement) Austin 12, Texas: The Texas Study of Secondary Education, 217 Sutton Hall, The Univ. of Texas. 1954. 148 pp. (8" x 11¼") $2.50. As a result of the one-week work-conference on junior high school held at the University of Texas in the summer of 1951, a committee was created to investigate the possibility of developing an evaluative instrument for the junior high schools in Texas. The committee decided that this was possible and feasible and set up a sub-group to pursue the project. Preliminary plans for a conference were given shape by a selected group of junior high-school principals meeting in Austin on December 14-15, 1951. These plans were further studied and revised by those attending a one-week work-conference on junior high-school problems held at the University of Texas, June 9-13, 1952. It was this final revision that served as a blueprint for the production group. Thirteen people at this conference took active parts in the actual production of this evaluative instrument. The conference met regularly from July 21 through August 15, 1952, in the University Junior High School building at Austin. From beginning to end of this period, stress was placed on the self-appraisal and improvement aspects of the task of evaluating a school.

The production group decided early to organize the evaluative instrument into two main divisions. The first of these consists of a comprehensive list of the characteristics of junior high-school pupils, together with the implications these have for the educational program. The second division offers specific criteria for the subject areas usually found in junior high schools as well as for the all-school activity areas, such as guidance and library services. The constant endeavor of the group was to keep the instrument as simple as was consistent with thoroughness. The criteria are divided into the following marking sections: I, School Community and Pupil Population; II, Junior High School Administration; III, School Plant, Facilities, and Equipment; IV, The Staff; V, The Junior High-School Pupil; VI, The Educational Program of the Junior High School; VI-A, The Core Program in the Junior High School; VI-B, Art; VI-C, Business Education; VI-D, Foreign Languages; VI-E, Health, Physical, and Safety Education; VI-F, Homemaking Education; VI-G, Industrial Arts; VI-H, Language Arts; VI-I, Mathematics; VI-J, Music; VI-K, Science; VI-L, Social Studies; VI-M, Special Education; VII, Library Services; VIII, Pupil Activities; IX, Guidance Services. Section X is a general bibliography classified under 17 headings. Each section presents an overview of the particular area under consideration. This is then followed by a listing of the criteria, each to be checked to the right as *none, some, much* in the light of pupil needs. These needs in turn are rooted in the characteristics of pupils who have reached the junior high-school level of development. These characteristics are fully set forth in Section V. Since the environment in which pupils live has a significant influence on the evaluation of any part of the school program, it is described in the section entitled School Community and Pupil Population (Section I). The criteria for each section consist of a series of statements or items numbered consecutively. This publication patterned somewhat similiarly to the Co-operative Study of Secondary-School Standard's *Evaluative Criteria* for the senior high school should be equally helpful to those desiring to evaluate the junior high school. Without a doubt, junior high-school principals and other administrators

will find this publication quite serviceable in evaluating the junior high school. It should supply a long-felt need in this area of evaluation.

GARBER, L. O. *The Yearbook of School Law, 1954*. Philadelphia 4: Univ. of Pennsylvania, The School of Education. 1954. 125 pp. $2.75. This, the fifth in the new series of Yearbooks of School Law, follows the same general plan of organization that has characterized earlier ones. In addition to a review of significant court decisions, it contains one chapter dealing with the most unusual cases. It also contains a special article dealing with a single subject—"What the Courts Say About School Board Meetings." Likewise, following the pattern set last year, it contains an "Annotated Bibliography of Recent Studies in School Law." To Prof. M. R. Sumption, Univ. of Illinois, who again contributed this feature, the writer is especially indebted. While the organizational pattern has remained the same, this Yearbook marks a departure from the earlier ones in one respect. In the past, each Yearbook considered significant court decisions reported during a calendar year. In the future, each will consider court decisions reported during the school year—July 1 through the following June. This Yearbook, in achieving a transition to the new plan, covers only those cases reported between December 1, 1952, and July 1, 1953. The result of this change will be to make the Yearbooks available for distribution earlier in the calendar year.

GREENE, H. A.; JORGENSEN, A. N.; and GERBERICH, J. R. *Measurement and Evaluation in the Secondary School*. New York 3: Longmans, Green and Co. 1954. 712 pp. $5. This revised edition is planned to provide a complete and systematic handbook for anyone requiring a straightforward and understandable discussion of all the fundamental ideas and techniques of evaluation in the classroom. Stress is placed on the crucial and practical problems of improving all types of teacher-made tests and examinations. By principle and by example, the construction, improvement, use, and interpretation of evaluative and measuring devices are treated in detail. Extensive new material is presented on the measurement of personality, performance tests, evaluative tools and techniques, and graphical representation.

HENRY, N. B., editor. *Citizen Co-operation for Better Public Schools*. Chicago 37: Univ. of Chicago Press. 1954. 289 pp. $4. In recent years education has become a topic for inflammatory comments in conversation and in the editorial pages of newspapers and magazines. The resurgent questions have been: Are our school children learning the fundamentals? Are the schools doing a better job than they did a generation ago? Are teachers sensitive to the needs and wants of the public as regards what is taught in the public schools? Can good citizenship be taught? Are citizens being as helpful to their schools as they might be? This book, Part I of the 53rd Yearbook of the National Society for the Study of Education, written by a team of outstanding educators, community leaders, and lay citizens, scrutinizes these and allied questions and goes far in answering them. In addition, it makes concrete and constructive proposals for the enlistment of citizen co-operation in: (1) avoiding the sterility which accrues from an unchallenged and unenterprising conformity to tradition, (2) escaping the dangers of uncritical and narrow indoctrination, and (3) incorporating the guidance and grass-roots wisdom of the great body of lay citizens in a manner both befitting and encouraging democracy. This is a timely book in view of the current focus of attention—suspicious and otherwise—on the problems and dangers of educating the young. This title, because of its obvious authority, may do much to dispel unwarranted fears and suspicions. Because it invites the support of the public and helps that public to make their support constructive, this publication may once more win for public education the enthusiasm which it must elicit if it is to grow and improve.

HENRY, N. B., editor. *Mass Media and Education.* Chicago 37: Univ. of Chicago Press. 1954. 300 pp. $4. This volume, Part II of the 53rd Yearbook of the National Society for the Study of Education, is concerned with the learning experiences of school children and with problems pertaining to the enrichment of classroom instruction through the introduction of and emphasis on audio-visual materials. But the nature and effects of such materials, as treated in the yearbook, are considered with respect to their role in the functional operations of society at large. Accordingly, while the educational implications of the effects of mass communications are appropriately recognized, the content and effects of messages disseminated through the mass media are viewed in light of their social values, as well. That is, consideration is given to the influence of mass-media messages presented to children of school age, whether received in connection with school activities or in some phase of out-of-school life. From the point of view of the service function of mass communications, the yearbook evaluates the present uses of mass media in relation to the generally accepted standards of democratic procedures in the administration of an American social institution or business enterprise. In keeping with this concept of the role of the mass media in American society, interpretive and illustrative materials are introduced to indicate the nature and influence of the commonly available media. Suggestions are presented on how to use mass communications to promote both social and educational objectives. The volume will prove to be a valuable guide to parents and teachers in the planning of social and educational experiences of children and youth. It will also serve the various cultural and vocational activities of adult-education groups. The book also contains a copy of the Society's constitution and by-laws (8 pages); the minutes of the Atlantic City meeting of the Society, February 14 and 17, 1953 (2 pages); a synopsis of the proceedings of the board of directors of the Society for 1953 held in Atlantic City, February 15, 1953 (4 pages); a reprint of the treasurer's report (2 pages); and a list of members (55 pages).

JOHNSTON, L. R., and JOHNSTON, A. G. *Schedule Building for Today's Secondary School.* East Orange, N. J.: A.M.G. Associates, Box 492. 1953. 87 pp. $3.75. The forms, techniques, and procedures described in this book facilitate the handling of thousands of items of registration data in a highly organized manner. These techniques make the conflict sheet unnecessary. Pupils are assigned to their respective teachers speedily and accurately. The exact number of pupils in each class and the precise design of each pupil's schedule is known as soon as the master schedule is completed. Consequently, all requirements for the opening day of school are known with confidence. Moreover, the characteristics of the method are accuracy, speed, and control. The schedule builder does a creative job as he determines individual pupil and teacher schedules, without writing a single schedule. An assistant readily interprets his decisions and writes the individual pupil's schedule. In contrast with many ways of schedule building, this method employs the special skills and training of each group of workers to maximum advantage. The professionally trained, responsible administrator makes decisions based upon accurate data; the clerical worker does rapidly those parts for which he is prepared and competent. Those who use this book will find in it a practical solution to one of the principal's most difficult problems. Some of the noteworthy features of this system as pointed out by the authors are:

1. Registration data is coded, making it possible to focus it on a special registration card in such manner as to make the data easy to handle and insuring speed and accuracy.

2. The registration card itself is a great advance over what is commonly used.

3. Students are grouped in terms of similarity in registration and given a group number; for example, the grid sheet helps greatly with this when the quantity and complexity warrant.

4. An analysis is made of each group on an analysis card.

5. Then a schedule is designed to fit the registration of each group.

6. The master schedule grows as each schedule for a given group is added to it. In other words, everything is precisely tailor-made.

7. At the moment the master schedule becomes a reality, the schedule for each pupil has been determined as to teacher, room, and period. Also, the exact number in each class is known.

8. The writing of the pupils' schedules becomes an easy, fast operation. The group number makes this possible.

KELLER, JAMES. *All God's Children*. New York 22: Hanover House. 1953. 314 pp. $2. Few Americans are aware of what can be done under existing laws to restore this basic element to our educational system. This book proposes a simple and practical method of bringing to every one of the thirty-six million young people in our schools—from kindergarten to university—a renewed sense of the importance of faith in God. The vast majority of Americans believe in God and they expect their schools to uphold this belief. Those who would exclude God from our school systems are a handful at the most. Their chief strength is usually the average good citizen's neglect in insisting that God and the teaching of moral and religious values are included, not excluded, from the curriculum. This book does not deal with the full religious training of our youth. Rather, it emphasizes the need for recognizing God in the very subject matter of the curriculum, whenever the facts call for that recognition. Education without any reference to religious influences is incomplete education, for it teaches only a portion of our history and culture. Most educators desire to make your child's education as complete as possible; to supplement, not to run counter to, the religious training in the home and church. But they need assurance that you are behind them in this important matter.

LAIRD, CHARLTON. *The Miracle of Language*. Cleveland 2: World Pub. Co. 1953. 320 pp. $4. This book is interestingly written. Subjects that might seem dull or forbidding suddenly come to life in simple and dramatic fashion—in such chapters as "Amoebas in the Dictionary," "Blessed are the Greedy for Words—for They Shall Have Vocabulary," "The Linguistic Child—Is He Father to the Man?" and many others. The author does not "write down" to the reader. Such important concepts as sound, word order, functional shift (conversion) in Modern English, the difference between inflectional and distributive language, and many other aspects of modern grammatical thinking are explored and explained—always in a style that will arouse the reader's curiosity and not overwhelm it.

LANDER, BERNARD. *Towards an Understanding of Juvenile Delinquency*. New York 27: Columbia Univ. Press. 1954. 159 pp. $3. This study analyzes the relation in Baltimore between the social and economic data for census tracts, given in the 1940 United States Census, and the juvenile delinquency rates for 1939 to 1942, inclusive. Its purpose is to contribute to an understanding of the differential juvenile delinquency rates by census tracts, and to aid in the prediction and control of juvenile delinquency.

LIVINGSTONE, SIR RICHARD. *On Education*. New York 22: Cambridge Univ. Press. 1954. 242 pp. $3. This book is composed of two parts. Education for a World Adrift is an attempt to consider what education can do to remedy the lack of standards and clear beliefs, which is the most dangerous weakness of the Western world. The Future in Education was the fruit of reflection on the results of our present educational system. We have a political democracy, but not yet an educated one. That is our problem. It cannot be solved without adult education.

LLOYD, FRANCES. *Educating the Sub-Normal Child.* New York 16: Philosophical Library. 1953. 156 pp. $3.75. While the education of the backward child of normal intelligence has received considerable attention, little has been written on the education of the child of low intelligence or on the organization, curriculum, and aims of the special school for educationally subnormal children. The author voices in this book her fervent belief in the value of special school treatment in helping these children to develop to the fullness of their capacity.

LONG, H. G. *Rich the Treasure; Public Library Service to Children.* Chicago 11: American Library Assn., 50 E. Huron St. 1953. 96 pp. $2. The author reviews the role of the public library in the life of the child so that the library's contribution may be made increasingly effective. The book traces the early beginnings of children's librarianship and relates the profession to contemporary thought about the child and to the stream of effort by which the modern community hopes to develop better citizens of tomorrow. The library as a guiding influence on the child's reading and cultural development is discussed.

MEDARY, MARJORIE. *Each One Teach One: Frank Laubach.* New York 3: Longmans, Green and Co. 1954. 237 pp. $3. "Everybody who learns must teach somebody else. If he doesn't I'll kill him!" Smiling at the man's violent good will, Laubach was suddenly electrified by his idea. He saw that nothing could be better for a newly literate person than to try sharing his skill with a neighbor. It would fix in the new reader's mind all that he had learned; would give him a feeling of importance and self respect; and, best of all, would train him in the spirit of sharing. If every learner actually became a teacher, literacy would spread like a prairie fire. Thus from the fierce loyalty of a Moro tribesman to his people came the idea of "each one, teach one," a method which has helped Frank Laubach's literacy campaigns to win over sixty million people from illiteracy from among the illiterate millions of Asia and the Middle East, Africa and South America. Born in Pennsylvania, trained as a sociologist and as a missionary, Dr. Laubach first found his life's work during his years in the Philippines. He discovered that the half-wild Moros of the interior had never had a written language —and so began his work of organizing a simple system of charts and key words, teaching methods which would enable people to learn to read their own language. In the years since then he has helped to prepare lessons, based on the same method, in over 239 tongues and dialects.

MILES, D. W. *Recent Reforms in French Secondary Education.* New York 27: Bureau of Publications, Teachers College, Columbia Univ. 1953. 175 pp. $3.75. Following a brief history of secondary education in France, the author discusses recent proposals for reform. Demands for secondary education that would prepare French youth for life in a rapidly changing technological society were increasing; at the same time a powerful group favored the preservation of the traditional classical curriculum geared to the preparation of an intellectual elite. The problems arising from this dilemma present implications of interest to American education at the secondary level as well as to French education.

MYERS, A. F., and WILLIAMS, C. O. *Education in a Democracy.* New York 11: Prentice-Hall. 1954. 367 pp. $4.50. This book is written as much for the consumer as for the producer; for the reader interested in social forces as much as for the prospective teacher. It may be read by those who are interested in education as a social science, or it may serve as a syllabus for a professional course, perhaps the first of a series of courses, in the curriculum for persons preparing for teaching. It will also provide a useful vocational try-out experience for pupils who are uncertain as to whether or not they wish to engage in educational work.

In preparing this volume the authors had in mind the course commonly called "Introduction to Education," an orientation course that aims to give the pupil a broad overview of the educational system and of the necessary steps in preparing for a career as a teacher. The major emphasis is placed upon the function of education in society, whether the pupil be a professional or a non-professional pupil. Attention is, therefore, given to the educational implications of contemporary social, economic, and political problems. All topics are approached with the idea of raising questions concerning the fundamental issues involved. Readers are encouraged to develop attitudes and express opinions, these objectives taking precedence over the acquisition of information in the customary textbook manner. The material is organized into units instead of chapters. This organization will lend itself to a contract- or unit-type procedure, with emphasis upon the broader implications rather than upon lesson assignments and recitations.

Typical problems or projects or topics for independent study or class discussion are included. Selected references do not comprise an exhaustive list by any means, but they are representative. The books will provide an opportunity for the reader to become acquainted with the best-known authorities in the field, and the magazine articles will inform him concerning current developments. These lists have been prepared to accompany each of the major divisions of each unit.

PODOLSKY, EDWARD. *The Jealous Child.* New York 16: Philosophical Library. 1954. 159 pp. $3.75. The jealous child is a common phenomenon in our culture today. Jealousy in children is generated by many circumstances: physical defects, ill health, economic and social conditions, emotional and mental deficiencies, and immaturities. In this book the causes of jealousy in children are examined critically and discussed fully. Remedial measures are proposed which can be put to practical application by parents, teachers, psychologists, and social workers.

ROBERTSON, STUART, and CASSIDY, F. G. *The Development of Modern English,* second edition. New York 11: Prentice-Hall. 1954. 479 pp. $7.35. This book attempts to present the historical background necessary for an understanding of the English language as it is spoken and written today. The authors have endeavored to introduce the general reader and the student who is beginning the systematic study of English to a selected portion of the mass of facts and doctrine that linguistic scholarship, of the last half-century particularly, has made available. In the belief that, for the general reader and the elementary student alike, the field of contemporary language is of paramount interest and value, the emphasis of the book has throughout been placed on present-day English. It has been the authors' purpose, however, to deal with the English of our own day in the light of the perspective that is afforded by a survey of the past. They can merely express the hope that their judgment as to the fitting proportion to be observed between past and present has been reasonably sound.

RUEBEL, R. F. *A Study of Teacher Supply and Demands in Wyoming, 1953-54.* Laramie: Bureau of Educational Research and Service, College of Education, Univ. of Wyoming. 1954. 20 pp. 25 cents. Discusses the problem of teacher supply and demands; describes what is being done in the way of training, and what can be done by high schools in the way of encouraging students to enter the teaching profession and by school districts in the way of providing adequate salary schedules and satisfactory living and working conditions.

SCHENK, G. K. *County and Regional Library Development.* Chicago 11: American Library Assn. 1954. 288 pp. $5.25. This book discusses the administration and operation of county and regional libraries, the basis for large unit libraries, their place in the community, and their relation to local government. It tells how to conduct cam-

paigns for the establishment of these library systems and points out dangers to avoid based on past experiences. The book contains excellent chapters on bookmobile and special services, personnel, and public relations. It has an appendix and a selected bibliography.

School Athletics: Problems and Policies. Washington 6, D. C.: National Education Association. 1954. 116 pp. $1. The high-powered competition, promotion, and commercialism typical of "bigtime" sports which have begun to color elementary- and high-school athletics in some parts of the country can cheat children educationally and may injure them physically or mentally. So says the Educational Policies Commission of the National Education Association and the American Association of School Administrators in this 116-page report.

Pointing out that the school's athletic program should be planned to benefit all the children, not just a few star athletes or a sports-minded community, the Commission of nineteen distinguished educators and lay citizens sharply criticize athletic practices which turn schoolboy games into public spectacles and teenage players into privileged characters. Hysterical over-emphasis on "winning the game," says the Commission, may pressure teachers into pampering the skilled athlete, force the coach to shortcut good sportsmanship when a victory is at stake, and may lead the student not specially interested or adept in athletics to "lose face" among his classmates.

Costs of the school's athletic program should come from general school funds, claims the Commission, warning of bad practices stemming from a school's dependence on gate receipts for financing: "To make as much money as possible, games are played at night during the week, and too many games are scheduled. Moreover, to prevent having to forego income. games are played in bad weather. To attract spectators, games are scheduled with unequal opponents. To accommodate large crowds, fire and safety codes may be violated. The feeling that spectators are necessary to get money to pay the bills is often a prime cause for exaggerated emphasis on winning games."

Although most of the bad practices cited by the Commission involve boys' interscholastics in senior high schools, members note an "alarming and unhappy" trend to lure boys from 8 to 12 years of age into highly organized sports competition. Pressures in such cases, according to the Commission, come from some adult organizations and business firms, often completely outside the school's jurisdiction, or from well-meaning adults who do not understand the needs of elementary-school pupils nor the potential dangers to their health. Such competition, whether under school or out-of-school auspices, is so detrimental to the welfare of children, says the Commission, that the situation "urgently calls for self-imposed controls by enlightened parents, educators, and other citizens."

The Commission also eyes critically traces of professional baseball's "farms system" operating at both the college to high-school level, and the high school to junior high school. "Interest of some colleges in recruiting high-school athletes," claims the Commission, "leads to many abuses. Boys may be taken to a college campus, entertained elaborately, and given 'tryouts.' They are sometimes offered financial inducements. Admission requirements may be waived or evaded. Cynicism is fostered when high-school youth see opportunities for college education made easier for athletes than for those who rank high in scholarship."

Similarly, promoters of senior high-school interscholastics often encourage junior high-school programs that will groom prospective talent for high-school teams. This, says the Commission, is exploitation of the junior high-school student which may have vicious results. It adds: "The junior high-school boy needs opportunities for wide participation in athletic activities of his own choosing and at his own pace. He needs

protection from overstimulation. This is especially true of the boy who shows early promise as an athlete. He needs careful guidance and may need to be deliberately restricted as far as intense competition is concerned, so that he may do himself justice as an athlete when he reaches fuller maturity. The term 'burned-out athlete' has special significance for the junior high-school boy." Stressing that athletic opportunities should be provided for each child, the Commission recommends "dual sports and team sports, easy sports, hard ones, indoor and outdoor, common games and unusual ones, some for boys alone, some for girls alone, and some for boys and girls together. There should be activities suitable for children with physical handicaps, some for small and delicate children, some to test the mettle of the larger and stronger ones."

The Commission recognizes that such a program of athletics-for-all costs considerably more than financing athletics-for-the-few, but it comments: "Unless a school has the former and unless it supports it with ample resources, it does not have a 'good' program." Underlying the report is the conviction that athletics should be an integral part of every school's curriculum. Discarding the notion that varsity games and practice sessions should be unique activities, the Commission calls for interscholastic athletics that are simply one of many school activities under the same administration and control as the rest of the school program and closely articulated with it. This means, they say, that athletic activities should be scheduled so as not to disrupt the school day, that games should be played only on school or public property, that varsity athletes should meet the same academic requirements as other students, and that such spectacles as the feverish postseason championship contests should be abolished.

State departments of education, says the Commission, should be responsible not only for establishing statewide policies governing athletic competition among different high schools within a state, but also for providing leadership that will help local schools to conduct sound programs in harmony with established policies. Other recommendations call on school personnel to establish goals for their athletic programs co-operatively with students and lay citizens, and to plan better athletic opportunities for girls.

SORENSON, HERBERT. *Psychology in Education*. Third edition. New York 36: McGraw-Hill Book Co. 1954. 587 pp. $5.50. This book provides an interpretation of the fundamental psychological facts, principles, and theories applying to education. Emphasis is placed on growth and development, with equal stress on physical, mental, and social growth; and the various phases of development are treated not as isolated stages but as part of an integrated pattern. This new third edition has been brought completely up to date. Illustrative material has been added and the teaching devices have been expanded, revised, and clarified. The interaction of teacher and pupil, with the consequent effects on the motivation, guidance, growth, and adjustment, is always considered.

Studies in Education, 1953. (Thesis Abstract Series). Bloomington: Indiana Univ. Bookstore. 1954. 258 pp. $1. Included in this publication are 44 theses. Each thesis gives the author's name, the type of degree granted, and an annotation of the individual's thesis. Generally, this is divided into an introduction, a discussion of procedures, and the findings and conclusions—and occasionally points out implications or offers recommendations.

TAYLOR, HAROLD. *On Education and Freedom*. New York 21: Henry Schuman. 1954. 320 pp. $3.50. This book deals with the controversial issues in contemporary American education from the point of view of one of its most provocative and interesting thinkers. At a time when American culture is under severe criticism for its materialism and mass conformity and American colleges are under similar criticism for

their failure to educate men and women who are politically literate, socially responsible, and out-spoken, the author of this book serves as a non-conformist, an independent, and a catalytic agent for new ideas in education.

THOMAS, R. M. *Judging Student Progress*. New York 3: Longmans, Green and Co. 1954. 435 pp. $4.50. This book is intended to help develop the knowledge and skills needed and used not only by elementary but also by junior high-school teachers in diagnostic and remedial teaching. Each chapter except the final one begins with an actual classroom or school incident. The incident pictures teachers talking and acting as they do in their daily tasks of judging students' progress. It is an attempt to bring to life evaluation practices which sometimes appear to be merely remote and unrealistic theory to the prospective teacher who reads educational textbooks. In addition to including introductory scenes, the writer has attempted to present the material in a direct style, unencumbered by unnecessary technical language which sometimes beclouds meaning in professional literature. The content of this volume differs in focus from that of some other evaluation books. The evaluation techniques included here were developed from an inspection of the procedures actually used by effective elementary-school teachers. It presents general descriptions of types of achievement, aptitude, and personality tests as well as practical criteria by which teachers can judge them. It does not include definitive descriptions of many tests. For such descriptions the reader is referred to the bibliographical references at the ends of the chapters on these topics. An inspection of the evaluation procedures used by modern teachers indicates that the prospective elementary-school teacher should be able to construct effective classroom tests, observe and record children's behavior accurately, judge children's social relationships, judge children's participation in class, organize records, talk effectively with students and parents, and report children's progress accurately. Teachers also should be able to organize an over-all evaluation program. The major portion of this book is dedicated to a discussion of ways these tasks are being carried out by elementary-school teachers.

Accompanying the book is a 32-page Instructor's Manual entitled *Judging Student Progress* which contains material that can be used by the instructor as class assignments.

TROTIER, A. H., and HARMAN, MARIAN, editors. *Doctoral Dissertations Accepted by American Universities, 1952-53*. New York 52: H. W. Wilson Co. 1953. 321 pp. $6. It is encouraging to note among the statistics that despite alarms of the cold war, doctoral scholars have quietly increased from 2,117 in 1944 to their present total of 8,604. Even more encouraging, perhaps, is that humanitarians in the field of the social sciences outnumber their nearest competitors in the impersonal physical sciences 2,520 to 2,410. Sobering, however, is the news that philosophy, once at the center of scholarship, numbers a stoic 131. As before, the dissertations in this 20th annual edition are grouped under seven broad headings: philosophy, religion, physical sciences, earth sciences, biological sciences, social sciences, and humanities. These, in turn, are divided into smaller categories, and for pinpointing the reader's favorite topic, there's a subject index. Helpful tables summarize (1) the rules in different universities for publishing and borrowing dissertations; and (2) distribution of doctorates by subject for the years 1942 through 1953. A special list reports current university serial publications which regularly abstract dissertations. In addition to the listing of Ph.D. degrees, there are doctoral degrees listed for education, science, jurisprudence, cannon law, and theology.

VANNIER, MARYHELEN, and FOSTER, MILDRED. *Teaching Physical Education in Elementary Schools*. Philadelphia: W. W. Saunders Co. 1954. 369 pp. $4.25. This book is first a presentation of physical education—what it is and what its place should be in our everchanging educational system. Secondly, it is a source book of

activities for children in grades one through six. Thirdly, it is a suggestion of how to teach children through these activities. It has been written mainly for three groups: (1) the specialized physical educator, (2) the classroom teacher, and (3) the college student who is training to be an elementary teacher.

WILLIAMS, J. F. *The Principles of Physical Education,* Sixth edition. Philadelphia: W. B. Saunders Co. 1954. 378 pp. $3.75. Every informed person is aware that economic, social, and political forces are shaping nations anew. Schools and colleges, like other social institutions, are feeling the impact of questions hurled at them by citizens who are vitally interested in the purposes proposed, the methods used, and the direction of programs. Physical education is also questioned. There is quick acceptance of the functional skills that are taught, recognition of its vigorous activities as the sure source of vitality in the people, and approval of its wholesome interest in play and recreation. But what is physical education doing to foster respect for the dignity of the individual? What are its plans for developing courage and self-reliance? What is its contribution to tolerance? What is its essential role in the continuing drama of the American Way of Life? These and similar questions have shaped the revision of this sixth edition. Attention to them has necessitated a complete rewriting of the text. Several chapters are entirely new and all are new in arrangement. The questions at the end of each chapter are new, and the references are revised to include recent sources. In order to make the principles more explicit and more readily apprehended by the pupil, they are presented in italics; after the statement a discussion of the principle follows. It is expected that this arrangement will enable the pupil to recognize readily the principle.

Books for Pupil - Teacher Use

ALLEN, M. P. *The Wilderness Way.* New York 3: Longmans, Green and Co. 1954. 246 pp. $2.75. Intrigue and danger face young Laurent Delair from the moment he arrives in New France. He chooses to follow La Salle in his daring attempt to find the mouth of the Mississippi while his powerful cunning enemies, who know the country, determine to ruin the expedition and kill them both. Joe You, experienced voyageur and humorous philosopher, undertakes to train Laurent. They claim all the great country for King Louis, realizing La Salle's dream. Standing beside La Salle, warmly understanding and admiring, is young Laurent Delair. Exposed to hardship and torture the boy lives to see his false cousin overtaken by the evil he had set for others. Laurent, now an experienced woodsman and voyageur, determines to make New France his home and bring probity to the fur trade.

AMES, EVELYN. *My Brother Bird.* New York 16: Dodd, Mead and Co. 1954. 125 pp. $2.75. Any way you looked at it, there was something queer about the Bennetts having so many adventures with animals and birds. They never had to pick a pet—the pets picked them! There had been, among others, a raccoon, a parakeet, a ram, a weasel, and a robin who ate from eighty to ninety worms a day, all dug by the Bennetts! This life story of a foundling pigeon can be laughed over or sighed over, depending on how seriously you take your friends in feathers.

ASWELL, M. L., editor. *New Short Novels.* New York 18: Ballantine Books, 404 Fifth Ave. 1954. 204 pp. 35c paperbound; $2.75 hardbound. This book is composed of four short novels: *Ride Out* by Shelby Foote (the story of a Negro horn player); *The Willow* by Elizabeth Etnier (a young couple on a Maine island discover the subtle ways in which the world can crowd into a paradise); *The Gentle Season* by Clyde Miller (a boy in a southern town unwittingly plays a major part in his aunt's marriage plans);

and *A Winter's Tale* by Jean Stafford (an American girl in Heidelberg in 1936 bent on romance).

BELL, A. M. *Midnight Creek*. New York 16: Thomas Y. Crowell Co. 1954. 218 pp. $2.75. Sam Lewellyn had his own reasons for never carrying a gun. Things may have been different back home in San Francisco; but since his arrival deep in Idaho Territory, in 1863, he had remained constantly unarmed. At first it didn't seem to matter. The tiny mining town of Emma, where Sam had staked out his claim, was a peaceful enough place until suddenly everything started to happen at once. First there was the hold-up at the Wells Fargo office. Then the handsome mysterious stranger, Jake Hamrich, arrived in town and, ten days later, was elected Emma's first sheriff. When Mary Ann Hardesty, an attractive young school teacher from Utah, stepped off the stage-coach into the isolated town with its four hundred bachelors, escorted by Snowy Fordyce who knew the truth about Jake's past, the stage was set for action.

BENDICK, JEANNE and ROBERT. *Television Works Like This*. New York 36: Whittlesey House. 1954. 64 pp. $2.25. Here is a fascinating, pictorial story of television behind the scenes that boys and girls will enjoy reading and from which they will learn much. It covers color television, educational television (its present status and its coming importance), and present-day alignment of networks. Here, in brief, are described the principles, mechanics, and the personnel involved in broadcasting a TV program.

BERRY, ERICK. *Hay-Foot, Straw-Foot*. New York 17: Viking Press. 1954. 95 pp. $2.50. A tale of fort life during the French and Indian Wars, as seen through the eyes of Si Cameron, a skinny, shirt-tailed boy from Litchfield, Connecticut. Si's experiences at Fort Crailo, near Albany, New York, are sure to make any reader chuckle, for his sense of humor gets him in and out of many strange situations with sutlers, recruits, and even generals. The fort was a busy place where battalions were recruited and trained, and officers mapped out strategy for the battles farther north.

BLACKHAM, H. J. *The Human Tradition*. Boston 8: Beacon Press. 1954. 260 pp. $3. Modern man is faced with three alternative philosophies, and his direction in the years to come will be decided by his choice among the three. One is Marxism; another, Christianity; and the third, secular Humanism. The author speaks for the last, bringing a wealth of learning and a readable style.

BLACKHURST, J. H. *Body-Mind and Creativity*. New York 16: Philosophical Library. 1954. 198 pp. $3. This book consists of sixteen discourses in dialogue form. Based upon the ontology of material monism, it attempts to present man as a God in the process of becoming. This task has forced the writer to new concepts of memory, will, self, and freedom. It attempts to provide a new base for ethics and democracy.

BLACKHURST, W. E. *Riders of the Flood*. New York 1: Vantage Press. 1954. 208 pp. $3. A savage river, ready to kill, playing a cat-and-mouse game with a man's life—this was the Greenbrier as it coursed through the white pine forests of West Virginia. In this book, the author presents a picture of logging on the Greenbrier some sixty years ago, a little-known, rich vein of Americana.

BLIZARD, MARIE. *Daughter of a Star*. Philadelphia 7: Westminster Press. 1954. 174 pp. $2.50. How would it feel to be the adopted daughter of a glamorous movie star—to be on the threshold of a movie career of your own? Francie Fenwick isn't sure that she wants to step into the second part of this picture, although she loves beautiful Diana Fenwick, who adopted her when her parents were in a tragic automobile accident only a few months after Francie was born. Diana wants Francie to follow in her own footsteps, but Francie doesn't want to be in the movies. The only trouble is, she doesn't know what she does want.

BLUNDEN, GODFREY. *The Land and People of Australia.* Philadelphia: J. B. Lippincott Co. 1954. 128 pp. $2.75. The author has painted a picture of his own country. After a description of the geography and geological history of the continent and an account of its aboriginal people, plants, and animals, he traces its development from the days of discovery and exploration to the present. Each territory is described in full with its natural resources, industries, and chief cities. The system of government is explained as the author recounts its development from early colonial days.

BOLTON, MIMI. *Merry-Go-Round Family.* New York: Coward-McCann. 1954. 253 pp. $2.75. Marie and her friend, Robin Blue, were a girl and boy lucky enough to belong to the glittering show world. When Marie's father decided to leave their home in Marshville to travel around Wisconsin's fairs and summer resorts with the "whirligig," Marie was delighted by the prospect of as many rides as she wished on a dashing steed of her very own. Adventures came naturally with such a life, and Marie and Robin had many exciting moments.

BOTHWELL, JEAN. *The Hidden Treasure.* New York 10: Friendship Press. 1954. 142 pp. $2. When the story opens, you meet Gopal and his best friend, Habib, a Muslim, facing separation for the first time in their lives. Habib is going to America with his family. Gopal is remaining at home in Lahore with his ailing father. But Gopal does not remain at home long. There is great uneasiness in the country, which breaks out in riots between Muslim and Hindu when India and Pakistan are about to become separate countries. Gopal has to flee from his home, accompanied only by Ganeshi, the family servant. On their 300-mile trek to reach safety, you see the terror of a country divided against itself, Muslim fighting Hindu, Hindu fighting Muslim. But you also witness courage and kindness, and you won't soon forget Ganeshi and her care of an orphaned Muslim baby.

BOURLIERE, FRANCOIS. *The Natural History of Mammals.* New York 22: Alfred A. Knopf. 1954. 398 pp. $5. This book, with 97 illustrations in line and 24 illustrations in halftone, is the first book in any language to provide a comprehensive picture of what naturalists working in both the field and the laboratory have so far been able to learn about the life and customs of mammals the world over. More aloof by far than the birds, the mammals, whose activities are so often nocturnal, yield the secrets of their lives only to the patient and practiced observer; and one of the great merits of the author's books is the skillful manner in which he has organized a vast amount of authentic and fascinating information on mammalian behavior culled from observations by zoologists in all corners of the earth. Throughout the book he emphasizes the interrelationship of the mammals with their environment and he demonstrates that mammal watching can be just as stimulating and instructive as bird watching.

How have the mammals adapted their means of locomotion to the widely differing environments of land, water, and air? What do they eat and what are their food habits? How do mammals organize territorially, and what types of shelter do they provide for themselves? What do we know about their sex life, the care and protection of their young, their progress from birth to old age? How long do various mammals live? These and many other exciting aspects of mammalian life—their social organization, migrations, the structure and dynamics of populations, and the complex action of environmental factors on their everyday existence—are discussed in clear and straightforward language that will make this book as valuable to the layman as to the specialist. Wherever possible, the text has been enriched by Paul Barruel's exceptionally fine line drawings and by many halftones, graphs, and charts. The up-to-date bibliographies at the end of each chapter and the general bibliography at the end of the book give this work a long-range reference value that will guarantee a place for it on every shelf of nature books.

BREIHAN, C. W. *The Complete and Authentic Life of Jesse James.* New York 16: Frederick Fell. 1954. 287 pp. $4.50. What kind of man was Jesse Woodson James? The author provides the data and it is for the reader to determine whether Jesse James was truly an American Robin Hood. The legendary Robin Hood is always depicted as one "who robbed the rich and gave to the poor." We don't know for sure whether or not it was in Jesse James' mind to rob "those who had it" in order to turn the money over to the "have-nots," but we do know that almost 70 years after Jesse's death he is a "beloved" bandit rather than one who is reviled and spit upon as, for instance, the Dillingers, Dutch Schultzes, Mad Dog Coles of today. It is interesting to conjecture, in the light of present-day psychiatric and psychological understanding, whether Jesse James would have trod the path of righteousness were he born in this era. And yet from the spiraling rate of juvenile delinquency in present times, it gives pause for thought as to whether the youth of today are any better than the youth who emerged into manhood during the unsettled days of the Civil War. No matter which line your thinking may pursue, the fact still remains that the writer in this book has unearthed every known bit of information about Jesse James, enabling the reader to draw his own conclusions. Sheriff Breihan has not limited himself to the factual historical data regarding the life and exploits of Jesse James—he has depicted the man as a truly human individual. He has explained why this blue-eyed husky Missourian was capable of shooting down a bank teller in cold blood, but also could and did teach a hymn-singing class. He explains how the man who stole hundreds of thousands of dollars at gun point, who killed scores of men during the Civil War and after—could also play Santa Claus (red suit, whiskers and all) to his children. In his extensive travels, the author unearthed many unique photographs and much documentary material never published before, and he presents in this book fifty illustrations to enhance the authenticity of his biography. As an example, the book contains a photograph of the gun which killed Jesse James; the gun was especially photographed for publication in this book.

BRIDGE, L. W. *The Funk and Wagnalls Book of Parliamentary Procedure.* New York 10: Funk and Wagnalls. 1954. 192 pp. $3. Here is a modern, authoritative guide to the proper conduct of all kinds of meetings, large and small, public and private. Democratic and effective procedure is essential to the success of every organized assembly, and the author has written his book to be as useful to women's clubs as to convention delegates, to civic groups as to corporation officers and directors. Presiding officers and members of fraternal and professional associations, university administrators and boards, church boards and trustees, teachers, students, and members of every sort of conference or assembly will find it helpful.

BROWN, FRANCIS, editor. *Highlights of Modern Literature.* New York 22: New American Library of World Literature, 501 Madison Ave. 1954. 240 pp. 35c pocket edition. A collection of essays from the *New York Times* Book Review magazine.

BROWN, H. E., and SCHWACHTGEN, E. C. *Physics, the Story of Energy.* Boston 16: D. C. Heath and Co. 1954. 608 pp. $3.80. The organization of the text is based on man's use of energy. The text begins with sound, a subject of immediate interest to pupils. Many fundamental concepts of physics are developed gradually by use of data tables based on laboratory experiments. Mathematics is simplified by the use of many worked-out examples and the frequent use of cancellation of units. Some basic mathematics related to physics (including the trigonometric functions) is found in an appendix. End-of-chapter materials include summaries, things to do, questions, problems, exercises for advanced study, and references. This is part of a complete physics program, including the text, Teacher's Manual, Tests, Key to Tests, Laboratory Manual, and Key to Laboratory Manual. Included in the text are: 3-D moving pictures, transistors, ultra-

high frequency TV, atomic submarines, tape recorders, and a brand new ten-page glossary containing about 400 terms. The book is divided into six units: Sound Energy (4 chapters), Light Energy (5 chapters), Energy and the Work of the World (4 chapters), Electrical Energy (10 chapters), Energy and Motion (4 chapters), and Energy and Molecules (5 chapters), or a total of 32 chapters, with each chapter divided into from two to six problems closely related to the everyday life of boys and girls of high-school age.

BROWN, HARRISON. *The Challenge of Man's Future.* New York 17: Viking Press. 1954. 302 pp. $3.75. On a subject of ever-more-immediate importance, the future of man on this planet, no one has heretofore attempted the major synthesis that this book represents. The book is a comprehensive analysis of our mortal prospects. It faces, in a world of giant technological advances, the infinitely disturbing questions posed by population growth, the world-wide rise in living standards, and the threatening limitations of food, mineral, and energy resources. It is clear that disaster may be upon us. Much of this book is startling, and some of it is hair-raising. Consider merely what it means when we say that the Oriental peoples must be brought up to Western levels. This means that China and India alone would consume many raw materials far in excess of the world's entire present output. Can industrial civilization possibly survive the strain? Or must we face reverting to the pastoral life of earlier ages? The answers are not simple, and the author does not try to make them sound so. His outlook is grave but not hopeless. We can reduce the birth rate; we can learn to eat plankton instead of pancakes; we can draw on the sun and the tides for energy; rocks will yield unexpected treasures. But none of these things will happen unless we take immediate action.

BROWNING, D. C., compiler. *Dictionary of Shakespeare Quotations.* New York 10: E. P. Dutton and Co. 1954. 302 pp. $4.50. Here is a Shakespeare volume, giving in compact form the essence of the plays and poems and enabling the reader to enjoy all their choicest riches without having to quarry for them himself. As a companion to the collected works, it will appeal to those who already know them well by bringing together all their favorite passages and so providing the ideal volume for general reference or for browsing over; and it will serve the beginner likewise as an introduction, enabling him to realize the wealth of the inheritance which awaits him in the plays and poems. Without professing to be exhaustive, the collection may claim to present all of Shakespeare that can be reckoned truly "quote-worthy." The main part of the book gathers together between three and four thousand quotations and extracts, arranged according to the usual order of the works, those from each play being prefaced by a brief summary of the play. The quotations range from little-known "jewels five words long" to complete speeches. The third and very important section is the full index to the key words and salient points of each quotation or extract, which enables the reader to turn at once to any piece or subject he wishes to look up, and to identify the play and the speaker. With this detailed index the book may well take the place of a more cumbrous Shakespeare concordance.

BRYAN, J., III. *Aircraft Carrier.* New York 18: Ballantine Books. 1954. 210 pp. 35c paperbound; $3 hardbound. This book graphically tells what it was really like on the giant *Yorktown* in the Pacific war.

CAMPANIS, AL. *The Dodgers' Way To Play Baseball.* New York 10: E. P. Dutton and Co. 1954. 256 pp. $2.95. The purpose of this book is to teach the amateur, the semi-pro, and the professional how to play baseball correctly. It is written in language which will be understood by anyone from a teen-ager to a college graduate and is addressed to the player, the coach, and the physical director. It will appeal to all types of players on all levels. The book is illustrated with 77 line drawings for most of which the author posed himself. These range from illustrations showing how the pitcher should

hold the ball across the seams to a line drawing showing how to give a sign to a base runner to steal a base.

CAMPBELL, ROY. *The Mambas Precipice.* New York: John Day Co. 1954. 189 pp. $2.75. This story of the adventures of a family vacationing on the coast of South Africa is not only full of incident and suspense, but it also presents a rich and vivid picture of exotic beasts and birds and marine life that we in North America are lucky to see even in zoos. All this is drawn from the author's first-hand knowledge of the country, its animal and plant life, and the Zulus among whom he was reared.

CANFIELD, DOROTHY. *Something Old, Something New.* New York 11: William R. Scott, Inc. 1954. 191 pp. These are stories that make citizenship live. In this book the author retells for children of today favorite family stories of real people told to her when she was growing up. They make pioneer spirit more vivid than a Hi-Ho Silver radio show. "History," she writes, "is not all in the textbooks; a lot of it is in family stories—old and new. True stories about real people today and of long ago give the raw material from which we can, if we think it over, draw more understanding of other people and of ourselves."

CARTER, R. S. *Those Devils in Baggy Pants.* New York 22: New American Library of World Literature, 501 Madison Ave. 1954. 192 pp. 25c pocket edition. This is the story of American parachutists in World War II—a story filled with suspense and inspiring gallantry.

CATTON, BRUCE. *A Stillness at Appomattox.* Garden City, N. Y.: Doubleday and Co. 1954. 448 pp. $5. This is the story of the last desperate, heartbreaking, cruel year of the Civil War. In the winter of 1864, the Army of the Potomac stood at the crossroads. The old army, fired with the spirit of men who had joined out of love of country and who had long since become disillusioned, was gone. The new army, made up of mercenaries, bountyjumpers, and a hard core of seasoned and embittered veterans, had lost sight of its original goal of radiant victory and had become a ruthless machine of war. Its leader was General Ulysses S. Grant, a seedy little man who instilled no enthusiasm in his followers and little respect in his enemies Opposing Grant and the Army of the Potomac was Robert E. Lee, the last great knight of battle. He was a god to his men and scourge to his antagonists. The stage was set. Somehow everyone knew that from now on there would be little glory in victory, little pity in defeat. The author takes the reader through the battles of the Wilderness, the Bloody Angle, Cold Harbor, the Crater, and on through the horrible months to the truce at Appomattox. He makes Grant, Meade, Sheridan, and McClellan come alive in all their failings and triumphs and humanness. This is the third and final volume of the author's saga of the Army of the Potomac and follows the distinguished *Mr. Lincoln's Army* and *Glory Road.*

CHAPEL, C. E. *Jet Aircraft Simplified.* Los Angeles 26: Aero Publishers, Inc. 1954. 176 pp. $3.75. After giving some very interesting history of jet propulsion (which actually was discovered in 120 B.C.), the book explains exactly what jet propulsion is and how it operates by providing many simple, everyday uses of this kind of power. The operations of the various types of jet powerplants (ramjet, pulsejet, turboprop, turbojet) are described and illustrated, and the latest jet engines of the various manufacturers such as Westinghouse, General Electric, Allison, and Wright are pictured and described. Nearly half of the book contains beautiful sepia-tone photographs, descriptions, and operation information on U. S. jet fighters, bombers, experimental jets, guided missiles, rockets, pilotless and rocket-powered airplanes. An index makes it easy to locate the coverage of any particular item.

The first edition of this interesting volume, published in 1950, was listed in the Library Journal, a leading library-book periodical, as one of the 100-best technical-type books of that year and has been read by thousands of Americans who desire a better understanding of jet propulsion principles and a knowledge of jet aircraft and engines. Due to the interesting and simplified presentation of the material, this book is also being used in high schools, technical schools, and junior colleges as a text or supplementary book for science and aeronautical courses.

CHASE, STUART. *Power of Words.* New York 17: Harcourt, Brace and Co. 1954. 320 pp. $3.95; text edition, $3. Besides semantics, the author discusses in this book other branches of communication, such as: cybernetics, linguistics, brain physiology, group dynamics, communication among animals, the perception experiments at Hanover and Princeton, and language development in children. After describing the new findings, he applies them to various fields, including mass media, campaign oratory, Russian propaganda, economic talk, schoolroom talk, medical talk, and varieties of gobbledygook. In his earlier books, the author succeeded in making economic subjects interesting and clear to the average intelligent reader. Since than he has turned to broader aspects of social science, reporting and trying to integrate diverse specialities, so that not only the general reader, but also the experts may better understand what is going on. This volume is another skillful example of integration in the sciences dealing with human relations. Chapter 25 entitled "Schoolroom Talk" will be of especial interest to school people and is a chapter well worth reading.

CLARK, DENIS. *Black Lightning.* New York 17: Viking Press. 1954. 144 pp. $2.50. Black Lightning is a raven-black leopard living on the island of Ceylon. When he is still a cub, he loses his parents and faces the green and mysterious world of the jungle alone. His encounter with a vicious crocodile, his battle with a great buffalo, his capture and sale to Castro's Imperial Circus, and his eventual escape are dramatically described. So is his return to the place of his birth, where he fights for and wins his mate—a splendid young leopardess. How his rival seeks revenge, how Black Lightning saves the life of a kindly old monk, and how the huge cat finally finds a refuge for himself and his family—all make moving and exciting reading.

CLARKE, A. C. *Expedition to Earth.* New York 18: Ballantine Books, 404 Fifth Ave. 1953. 176 pp. 35c paperbound; $2 hardbound. This is a collection of eleven science-fiction stories written by the author.

CLARKE, A. C. *Prelude to Space.* New York 18: Ballantine Books. 1954. 172 pp. 35c paperbound; $2.50 hardbound. This is a novel of tomorrow's greatest adventure by today's author-scientist.

CLARKE, JOYCE, and DICKSON, SALLY. *A Woman's Guide to Financial Security.* New York 16: M. Barrows and Co. 1954. 185 pp. $2.75. This is a woman's book on money. It is meant for her—if she receives a pay check, handles family money, or has an inheritance she wants to invest securely. Whether she is a working woman on her own, a widow with children to educate, a wife approaching retirement years with her husband, or just a victim of inflation trying to stretch a once-comfortable income—she needs this wise financial counsel. Here are the facts about her rights under Social Security and company pension plans. Here is full information on the many investment opportunities open to her—the advantages and disadvantages of each—whether conservative or speculative—and how each affects her taxes. Some of the chapters are: You and Your Savings Account; You and Life Insurance; You and Government Savings Bonds; You and Real Estate; Primer of Stocks and Bonds, and You and Mutual Funds; and You and Your Investment Plan.

COLBY, C. B. *First Rifle (How To Shoot It Straight and Use It Safely).* New York: Coward-McCann. 1954. 48 pp. $2. Here are text and 100 sketches and diagrams about how to use a gun with safety and for good shooting and good fun. Various rifles are discussed, slings are described, targets and scoring are given attention, and sighting and pulling the trigger are given important coverage.

COLES, MANNING. *All That Glitters.* Garden City, N. Y.: Doubleday and Co. 1954. 189 pp. $2.75. Tommy Hambledon finds that a case of "breaking and entry with violence" is international dynamite when top-secret designs vanish and four Berlin thugs try to fleece the M.V.D.'s. A vengeful consumptive, a recalcitrant demimonde, and a fugitive Russian join the hectic chase across the zigzig zones of Berlin, and complicate an explosive case with a stolen fortune, stolen freedom, and murder. This is a detective story with the scene laid in Germany and Russia.

COON, HORACE. *Speak Better, Write Better English.* New York 22: New American Library of World Literature, 501 Madison Ave. 1954. 167 pp. 25c pocket edition. This is a new kind of up-to-the-minute guide to mastery over words. The book contains five sections: Correct Reading, Writing, Speech, Grammar, and Vocabulary Building, each accompanied by its own self-scoring tests and easy practice exercises. A Signet Book.

CORBIN, WILLIAM. *High Road Home.* New York: Coward-McCann. 1954. 256 pp. $2.75. Nico La Flamme leaped off a moving train in Cleveland, Ohio. He wasted no time looking behind him, but almost at once he heard a shout, "Stop that kid!" Nico had come to the United States to hunt for his father, whom all authorities, French and American, believed dead long since. His search began in Cleveland and extended through Columbus, Chicago, St. Louis, across the plains, and on to the coast. As he traveled, he met people—ordinary people, unusual people, a gas station attendant, a motherly housewife, a man who knew the history of Cincinnati, a noisy family, an Indian, a wise and visionary bum, people who hindered him, people who helped him. Worst was a menacing tramp in a freight car. Best was an older boy, Dud, who became Nico's good friend and the companion of his travels. In the course of his adventure, Nico discovers America. In a series of remarkable vignettes, the author conveys the grandeur and immensity of the United States. The pictures are not always beautiful. It is the United States of grimy lunch rooms—but also of the Golden Gate. Yet Nico, who in Paris has seen Americans at their worst and who has felt the all-too-human dislike of the have-nots for the haves, learns to make some drastic revisions in his thinking. But the author has not borne down with a heavy hand on that aspect of the story. This book has humor—and here and there pathos. Above all it is adventurous, absorbing, tense, dramatic, and surprisingly realistic.

COYLE, D. C. *The United States Political System and How It Works.* New York 22: New American Library of World Literature, 501 Madison Ave. 1954. 152 pp. 25c pocket edition. This book tells how a young country without any hallowed tradition of race or privilege happens to have the oldest constitutional government in the world today—this being achieved without ideological political parties, because Americans like it that way. The author explains how political parties, the courts, Congress, and Federal, state, and local governments work together in a unique system of give and take to meet changing national needs and world situations.

CROMPTON, JOHN. *The Life of the Spider.* New York 22: New American Library of World Literature, 501 Madison Ave. 1954. 192 pp. 35c pocket edition. An absorbing account of one of nature's most fascinating creatures.

dal FABBRO, MARIO. *Furniture for Modern Interiors*. New York 18: Reinhold Pub. Co. 1954. 207 pp. (8" x 10¼") $7.50. This new book describes and depicts over 200 selected examples of modern furniture created by internationally famous designers both here and abroad. The author offers an entirely new approach to the presentation of furniture designs. His book is divided into two sections: the first consists of a series of rooms and room settings in which modern furniture is used. This section, in turn, is further divided into individual room types: halls and entrances, living rooms, bedrooms, studies, *etc*. Each of these room types, comprising a separate chapter, is described in caption form and is illustrated with both photographs and detailed drawings by the author. The second section is organized by individual furniture pieces—chairs, tables, cabinets, beds, *etc*.—in the same illustrative style as the previous section. Special attention is given not only to latest advances in furniture design, but also to pointing out which pieces have attained success in mass production and which are of interest for future development.

DANTZIG, JOBIAS. *Number: The Language of Science*. New York 11: Macmillan Co. 1954. 352 pp. $5. This newly revised and augmented edition of this book is without doubt an important addition to the library of scientific books for the lay reader. In response to requests of readers of the earlier editions, the author has brought up to date the first section of his book, "Evolution of the Number Concept," and completely rewritten Part Two, "Problems, Old and New." In a series of chapters, he unfolds the evolution of the concept of number for the cultured non-mathematician. Some of the chapters deal with history, others with philosophical questions; still others deal with symbol and form and the ideas which are back of them. The author presents his view with an almost complete avoidance of mathematical technicalities so that the intelligent and cultured layman will find it readily understandable.

DARLING, ALICIA. *Speak to Us of Children*. Boston 20: Christopher Pub. House. 1954. 112 pp. $3. Pleasant memories play an important part in our lives, and those most cherished are the happy moments of childhood. To enhance these moments, the author has dedicated a collection of essays, poems, prayers, *etc*., to those whose sacred trust it is to guide the steps of youth. These have been gathered over a period of years from her work with them and from other sources. The material selected was chosen because, in its beauty and elegance, each essay brings a special message to be kept aglow in the hearts of men.

DAVIES, A. POWELL. *The Urge To Persecute*. Boston 8: Beacon Press. 1953. 219 pp. $2.75. Dr. Davies, pastor of All Souls Unitarian Church, Washington, D. C., has long been known as one of the most outspoken, influential, and dynamic preachers in the national capital. It is subversive *inactivity* upon which he turns the spotlight in this book. He says that Americans do not need bogus saviours, waving banner headlines, and feeding on publicity, to redeem them—all we need is a rededication to the principles which made this country great. While we chant happily that it can't happen here, the author shows that it *is* happening here and that we are not disputing vigorously enough the rape of our freedoms. The book is divided into four parts: The Modern Predicament; The Fruits of Frustration; The Retreat From the Founding Principles; and In the Time Remaining.

DAVIS, C. B. *The Newcomer*. Philadelphia: J. B. Lippincott Co. 1954. 216 pp. $2.75. The hero of this novel is involved in the greatest crisis of his life. His fight for recognition, as he recounts it, commands breathless interest and the strongest possible sense of identification. He is a man to be pitied and a man to be cheered when in the end he wins out. Actually, the man of this story is a boy, facing the exquisite torture of

moving to a strange town as a new boy; but men (and even women) who read it will be reminded again, *via* the author's brand of magic, that however much this book may make them laugh now, the buffetings of boyhood can try the soul and bruise the ego as deeply as anything besetting the care-wore adult.

DICKSON, MARGUERITE. *Bramble Bush.* New York 3: Longmans, Green and Co. 1954. 270 pp. $3. It was an anticlimax to return to the school from which she had been graduated in June and prepare for a fifth year there, studying typing and shorthand. Then the vacant house near the Cliffords was taken by a family with a girl her own age. She might be fun, Mary Elizabeth thought, but when she met Ruth Anderson, she learned the new girl was blind. The shock of meeting a girl like herself, young and vital, who could not see, brought Mary Elizabeth out of her own depression and self-pity. To help Ruth work out a more normal way of life proved a challenge.

DUTTON, WILLIAM. *Stay On, Stranger!* New York 3: Farrar, Straus and Young. 1954. 79 pp. $1.75. This is a dramatic tale of backwoods America—the story of one woman's efforts to help a community lift itself by its boot straps. Deep in the mountains of eastern Kentucky, in Knott County—"the forgotten heart of America"—is a school known as Caney Junior College. It was built by the illiterate that their children might have a chance to learn to read and write, and it is directed by Alice Lloyd, the county's most beloved citizen. When Mrs. Lloyd first came to Caney Hollow there was not a public high school—much less a college—in the entire community, nor was it felt there was need for one. The authorities said that generations of isolation, poverty, disease, feuding, and intermarriage had produced a race of incompetents, and the natives themselves resorted to the rifle and the "shot-gun" when Mrs. Lloyd attempted to build an elementary school. But she persisted, and she told a gathering of mountain people that she needed their help in erecting a schoolhouse, and that in turn she would not mix in their politics, religion, or moonshining. "Stick to that, ma'am," said a mountaineer, "and we-uns and you-un will get along." Now almost eighty, crippled and partially paralyzed, Alice Lloyd can be found at her typewriter 365 days of the year, writing to friends on the "outside" for money and equipment for her college. Caney received no Federal or state aid, and a native told the author: "Our endowment isn't so much as a plugged dime, but to my way of thinking, we're the richest school in America, bar none. I was born yonder in a holler. My father couldn't write his name, but he sent me to Caney and he helped build it."

EATON, CLEMENT. *A History of the Southern Confederacy.* New York 11: Macmillan Co. 1954. 365 pp. $5.50. This documented history shows the devastating effect of war on a human society—in this case on the mind and heart of the old South. The author is no sectionalist. He writes with equal compassion for both sides, aware of the sacrifices of each. While many books have depicted only the military or political history of the Confederacy, this account encompasses both as well as the economic and cultural life of the South under the influence of war. The author has gathered many new and illuminating facts from hitherto unused records. In his analysis of the battles lost by the Confederacy, he shows how the role of the victor and vanquished might have been reversed—though he does conclude that the South could not have won a final victory.

EBERHARDT, E. G., compiler. *Eberhardt's Bible Thesaurus.* New York 16: Exposition Press. 1953. 735 pp. $5. The compiler has selected choice scriptural texts from the Bible and arranged them alphabetically under a large number of topics in order to show what the Bible teaches and to aid persons in study and devotional reading. Choosing those texts which are most meaningful to our day-to-day existence, he gives

the reader the heart of the matter in a condensed, yet highly readable form. Indexed, cross-referenced, and divided into chapters, this book supplies a ready means of ascertaining just what the Bible has to say.

EBERHART, M. G. *Man Missing*. New York 22: Random House. 1954. 305 pp. $2.50. In this the author takes us to a man-made oasis in the western desert, where a hot sun lies like a dry blanket over an uneasy Naval hospital and a murderer vanishes into the night. Sarah Keate, who had a certain small deductive ability and a very definite interest in crime, had taken over as a temporary civilian nurse at the Naval Ammunition Depot near Wanaha City. The silent, sleeping hospital was in unnerving proximity to the high explosives stored on the base. Suddenly, in the shadowy, whitewalled corridors, Sarah caught sight of a khaki-clad figure and saw the flash of three stripes of gold braid on a shoulder board. Moments later she discovered that one of her patients, Lieutenant Parly, a young officer with a bad record, was dead, his throat cut by a government-issue clasp knife. A murderer had evidently walked into the hospital—unobserved—and slipped out the door again, still unobserved—except for the glimpse Sarah had had. And now—whoever the murderer—he was creeping around in the night. Tempers were already frayed, just from living surrounded by burning hot sand. But when a second corpse was discovered, and when blackmail seemed to have a part in the puzzle, gossip and excitement reached a fever pitch. Then, in a burst of inspiration, Sarah realized who the murderer was. . . .

Editing the Yearbook. Nashville, Tenn.: Benson Printing Co. 1951. 128 pp. (9" x 11⅞") $5 cash; $6 on open account. Written especially as an aid to yearbook staffs for the production of an outstanding annual, this book includes general and technical information based on forty years of experience in the specialized field of printing annuals. The methods suggested herein require a minimum of time from the staff members who, we realize, must pursue their studies in addition to turning out a creditable book, within a limited period of time. Almost every conceivable problem that may confront the annual staff has been encountered and solved in the past while producing thousands of annuals ranging in size from fewer than fifty pages to five hundred pages, for many schools, colleges, and universities.

With this vast experience, comprehensive instructions to cover every phase of producing a yearbook are given. A unique system of approach to the work has been developed, a new type of dummy has been devised, and simplified methods of procedure have been introduced. This system—told in detail in this instruction book—if closely followed, will save the staff considerable time and trouble since it co-ordinates the work of the photographer, engraver, and printer. As evidence of its merits, this system has been copied in full or in part by many engravers and printers. Although the production of photographs and engravings are not a part of the printer's work, they are an integral part of producing an annual. This book of instructions, therefore, includes full details of these phases of the work.

ELICKER, V. W. *Biblical Costumes for Church and School*. New York 16: A. S. Barnes and Co. 1954. 160 pp. $3. This volume answers the often-asked questions of Sunday School teachers, program directors, and students of the Bible: Just what sort of costumes do we need? How can we make them? The author tells what the Hebrew men and women of various phases of the Biblical period wore, and also what their contemporaries in Greece, Rome, Assyria, Egypt, and Persia wore. She describes these garments in detail, including the mention of color, and her textual description is illustrated by more than twenty line drawings. To aid the reader in making his own costumes, the author names the materials best suited to these garments and tells where they can best be procured.

EMERY, ANNE. *High Note, Low Note.* Philadelphia 7: Westminster Press. 1954. 214 pp. $2.50. Jean Burnaby is entering her senior year of high school. On the first day of school she meets Kim Ballard, whose father is a well-known foreign correspondent. Jean is intrigued with Kim's dynamic personality, and a friendship springs up between the two which eventually brings all kinds of complications into Jean's life.

ESCHER, FRANKLIN, JR. *A Brief History of the United States.* New York 22: New American Library of World Literature, 501 Madison Ave. 1954. 160 pp. 25c. The dramatic story of America, from the phantom days when the Norsemen cruised its shores to the Eisenhower era with its crucial world problems. A unique, concise summary of the important trends and events in American history, this is a fascinating chronicle of the thoughts, actions, and development of a country which emerged from the wilderness to become a leader among nations.

FERBER, EDNA. *Cimarron.* New York 10: Globe Book Co. 1954. 383 pp. $2.56. This novel based upon the history of the United States leads pupils to consider many important subjects such as reasons for regional development, methods of maintaining law and order, race discrimination, ethical ideals, *etc.* This is the edition adapted for school use by F. H. Law, formerly head of the Department of English in Stuyvesant High School, New York City.

FISHER, M. M. *Negro Slave Songs in the United States.* Ithaca, N. Y.: Cornell Univ. Press. 1953. 239 pp. $4. The songs and spirituals of the American Negro are recognized as being among his most unique and valuable contributions to the world. The haunting melodies and swinging rhythms of Negro music have won a special place in the hearts of millions. What few people have known, however, is the fact that the Negro spirituals and songs of the antebellum South were more than simply musical expression. They were, in the author's words, the "oral historical documents" of a people. In Africa, before the Negroes were brought to America, the tribes discussed their contemporary problems and kept their history alive by means of songs. When they were transplanted to America, they continued to use this song heritage as they had done before. As "decoded" by the author in this book the spirituals reveal data respecting their authors, their dates, their places of origin, and their messages. Plans for escape, protests against slavery, longing to be at home in Africa (particularly after the American Colonization Society was organized in 1816)—these are a few of the hidden meanings that come to light when the author analyzes some of the well-know antebellum spirituals.

FISHER, WILLIAM. *The Waiters.* New York 22: New American Library of World Literature, 501 Madison Ave. 1954. 224 pp. 25c pocket edition. This is a novel of life behind the scenes in a big restaurant. A Signet Book.

FREIDEL, FRANK. *Franklin D. Roosevelt: The Apprenticeship.* Boston 6: Little, Brown and Co. 1952. 464 pp. $6. This is the first of a six-volume series on the life of the late President—a major work which is likely to become the definitive Roosevelt biography of our time. A review of the author's second volume appeared in the Book Column section of the March, 1954, issue of this publication. The material presented in this first volume will be invaluable for future generations. "But," says the author, "it is for this present generation that I am trying to write. Roosevelt looms so large in our immediate past that we need a full-scale biography of him as a contribution to the understanding of our own times." Neither a found memoir nor a partisan political trace, the author's book is a biography based on the voluminous Roosevelt papers at Hyde Park, and the first to make extensive use of manuscript and archival materials elsewhere. The author began work on the project in 1945; since then he has talked to and corres-

ponded with the men and women who knew Roosevelt and worked with him and has uncovered important unrecorded material which might otherwise have been lost forever. His researches throw a strong, clear light on the many facets of one of the most complicated men of our age.

Because a biography of such breadth is only as valuable as it is dispassionate, the author's aim has been to write with complete objectivity. He presents such indisputable factual evidence of what Franklin D. Roosevelt really did that, for the first time, it is possible to assess accurately his strengths and weaknesses. It is as though the author were writing about some outstanding figure of a much earlier generation, and comparison with such great works of biography as Dumas Malone's *Jefferson and His Times,* Douglas Southall Freeman's *George Washington,* and James G. Randall's *Lincoln* becomes inevitable.

Volume One, *The Apprenticeship,* covers the period from Franklin D. Roosevelt's birth through the First World War when the future President was Assistant Secretary of the Navy under Secretary Josephus Daniels and President Wilson. Roosevelt's childhood is completely treated, including new material on his father, James Roosevelt, whose influence has up to now been almost completely ignored. Next come the years of Groton under the remarkable man and equally remarkable educator, Rector Peabody; then Harvard College and the editorship of the *Harvard Crimson;* law school; marriage; and a Wall Street practice. The influence of Theodore Roosevelt on his young cousin is thoroughly explained. In 1910, Franklin D. Roosevelt stepped into politics for the first time in the campaign for state senator from Poughkeepsie. His election brought him into the battle with Tammany Hall, the battle which would spread his fame and bring him to his Navy Department post in the Wilson Administration.

GARST, SHANNON. *Joe Meek, Man of the West.* New York 18: Julian Messner. 1954. 191 pp. $2.75. Joe Meek—mountain man, trapper, explorer, Indian fighter and pioneer—was instrumental in establishing the territorial government of Oregon and was appointed its first United States Marshal. Joe was only nineteen when he ran away from his father's Virginia cotton plantation. Two of his brothers had already gone West and Joe caught up with them in St. Louis. Hiram was happily married and the owner of a grocery store, but Steve was a member of William Sublette's trapping expedition and this was what Joe wanted to do, too. Sublette refused to take him because he was too young; so Joe stowed away as a mule boy, and when he was discovered, it was too late to send him back to St. Louis. So began a life of incredible adventure—but young Joe thrived on it.

GIBSON, R. C. *Journey to the Purple Mountains.* New York 1: Vantage Press. 1954. 52 pp. $2. In this book the reader, as he travels along, learns with each advancing step a greater love for his fellowman. Surrendering himself to Divine Guidance, he discovers the art of living through the redeeming virtues of forgiveness, sharing, understanding.

GOUGH, VERA. *You're the Speaker.* New York 16: William Morrow and Co. 1954. 158 pp. $2.50. Here are the answers to many questions that face you when you face the public, whether you are talking at a small business conference or at a large public meeting. How do you prepare a speech—not just how do you write it and rehearse it, but how do you prepare yourself, psychologically, for its delivery? Each chapter ends with an "over to you" section that tells you just exactly what and how to practice. In this way you have the benefit of the same kind of practice sessions you would experience if you were receiving personal instruction from this famous speech instructor.

GRAHAM, A. W. *Indigo Bend.* Garden City, N. Y.: Doubleday and Co. 1954. 314 pp. $3.95. In 1871, with carpetbaggers overrunning the South, and with most of

the men either broken in spirit or dead in battle, women like Louise rose up to give new strength to the vanquished land. Her husband had been one of those who died, leaving her with little Tommy. Her brother had been badly crippled at Shiloh and her father was too old to take up the cudgels again. Louise was faced with the problem of how to hang on to the big house in Natchez and the lovely plantation at Indigo Bend. She was a strong woman and a good one, but at first she was appalled by the loneliness of the plantation, by the bleakness of the house, and by the prospect of the overwhelming task she had set for herself. But gradually she began to see beauty in the woods and fields and swamps of Indigo, and to make friends with the people who lived around her. She even befriended the two children of Josh Sanders, the Yankee who owned a neighboring plantation and who held the mortgage on Indigo. So begins this turbulent story of love torn by divided allegiances—a story of rare courage, full of the sights and sounds and smells of plantation life, told with humor and understanding and written from a deep knowledge of the people and the times.

HARRER, HEINRICH. *Seven Years in Tibet.* New York 10: E. P. Dutton and Co. 1954. 354 pp. $5. This is the story of a young adventurer's escape from a British internment camp in India during World War II and his dramatic trek through rugged Himalayan passes to sanctuary in the Forbidden City of Lhasa. The adventure began just at the outbreak of war. The author, a noted Austrian mountain climber and skier, was with the Nanga Parbat reconnaissance group in Karachi awaiting a steamer to Europe. The group, detained by the English, immediately began a series of desperate attempts to escape. Finally succeeding, Harrer and a companion, another skilled mountain climber, began their tortuous journey of twenty-one months to Tibet. Posing as Indians, with hair and beard dyed black and skin stained, they attempted some of the most unusual and exciting exploits ever narrated. The reader has an unmistakable feeling that these two mountain-loving men are a breed apart and that in stature they rival the magnificence of the peaks they bypass and traverse. After posing as the vanguard of an important personage en route, they win through to the closely-guarded city of Lhasa. What follows is a modern fairy story; the author, a destitute vagabond, gradually becomes the confident of the youthful Dalai Lama, the fabulous religious leader of the Tibetans. Loaded with constant gifts and granted complete freedom of movement, Harrer and his companion start an irrigation canal for the Tibetans, build a fountain, introduce ice-skating, attend gymkhanas, do some mountain-climbing, and are constantly invited out and consulted. The author becomes photographer and tutor to the living Buddha and eventually builds a motion picture projection room for him. Hundreds of fascinating details of life in Tibet provide a unique understanding of this mysterious land which has never lifted its veil of secrecy and exclusiveness.

HAWTHORNE, NATHANIEL. *The Scarlet Letter.* New York 10: Globe Book Co. 1954. 243 pp. $2. Herbert S. Robinson has adapted and edited this famous classic for high-school use.

HEUSS, JOHN. *Do You Want Inward Power?* Greenwich, Conn.: Seabury Press. 1953. 182 pp. $2.25. This book is composed of thirteen sermons delivered recently in New York's famous Trinity Church. Since this old and historic church draws to its crowded pews each Sunday worships from all corners of this country, and frequently from abroad, the sermons are broad in concept, inspiring, and simply presented. Because of these very factors, average, intelligent laymen of all ages can easily find new understanding, inspiration, and a deepened appreciation of the faith in this well-rounded selection of sermons.

HOBBS, H. J., editor. *Money-Saving Home Improvements.* New York 13: Home Craftsman Pub. Co. 1953. 198 pp. $4.95. Building authorities estimate that fully one

half of the 43 million homes in this country are in need of substantial improvement and repair. Now, with the guidance of this book, the average home owner can undertake the modernization of his home one step at a time—and he can do it with every assurance of having all the information he needs to complete the project. The editor's purpose in producing this book was to present home modernizing problems with the details of the job filled in so the amateur can follow through to completion. A glance at any one of the working drawings inside will reveal an abundance of construction detail—dimensions, joints, and directions. It is this special feature that makes this book a thoroughly practical manual—a working guide for the home owner. Dozens of experts in every field of mechanics were enlisted to build this book. A registered architect, for example, shows how to remodel a basement. Another architect presents house framing details. A designer of kitchen cabinets prepared the section on kitchen TV cabinets. And they actually built and installed the cabinet to check the accuracy and detail of the drawings.

HODGE, W. V. D., and PEDOE, D. *Methods of Algebraic Geometry*, Volume III, Book V: *Birational Geometry*. New York 22: Cambridge Univ. Press. 1954. 346 pp. $7.50. This volume provides an account of the modern algebraic methods available for the investigation of the birational geometry of algebraic varieties. It is written to meet the needs of those geometers trained in the classical methods of algebraic geometry who are anxious to acquire the new and powerful tools provided by modern algebra, and who also want to see what they mean in more familiar terms. The volume is, therefore, primarily concerned with methods. The authors have again confined their attention to varieties defined on a ground field without characteristic. In order to familiarize the reader with the different techniques available to the modern algebraic geometer, they have not confined themselves to one method, and on occasion they have deliberately used more advanced methods where more elementary ones would serve, when by so doing it has been possible to illustrate the power of the more advanced techniques, such as valuation theory. The chapter titles are: Ideal Theory of Commutative Rings; Arithmetic Theory of Varieties; Valuation Theory; Birational Transformations.

HOGAN, INEZ. *A Bear Is a Bear*. New York 10: E. P. Dutton and Co. 1953. 48 pp. $2. This is an interesting story about bears written for younger pupils or the very slow reader.

HOLT, SOL, and McCRACKEN, H. L. *Economics and You*. New York 17: Charles Scribner's Sons. 1954. 560 pp. $3.48. If ever a time called for the teaching of an understanding and appreciation of our free enterprise system, this is it. Confronted by the challenge of a totalitarian society, our system must be understood by the youth who will inherit it if we expect them to defend it. The issue is no longer a clash of academic principles and obscure generalities, but one of pressing and immediate concern to all who live by and under the free American system. For the achievement of this fundamental understanding this book was planned and written. Much time and effort has been expended to make this book interesting and intelligible to young people. To that end every subject and almost every paragraph begins with some interesting point of contact with which pupils are familiar, whether it be baseball, television, the school lunchroom, or the neighborhood in which they live. The illustrations have also been selected with this objective in mind. Thus pupils are led from the known to the unknown, from the familiar to the unfamiliar, from the experiences of youth to the realities of adulthood. To assist teachers in planning lessons and to help pupils in obtaining mastery of the subject, a number of class-tested teaching devices have been included. At the end of each chapter there is a short informational quiz and a group of questions that require thinking about, rather than recall of, subject matter. A number of current topics suitable for forums, debates, and reports, and a brief bibliography of suitable references is also

included. Furthermore, an activity problem has been mapped out at the end of each chapter. It will be noted that these problems require all types of student activity including interviewing, measuring, observing, recording, visiting, and constructing as well as reading. The author's purpose has not been to make research scholars or financial wizards of pupils, but rather to make them economically literate so that they may understand the business and industrial system under which they live.

Additional learning airs for the teacher and pupils include an annotated list of novels based on economic ideas, a feature called "How It Began" which describes the interesting origin of many economic terms, a suggested program of sound films to provide visual enrichment of the subject, and an extensive glossary of important economic terms.

HUSSEY, W. D. *Discovery, Expansion, and Empire.* New York 22: Cambridge Univ. Press. 1954. 142 pp. $1.25. The aim of this book is to give a wide general account of the early voyages of discovery and the expansion of the European nations into Asia, Africa, and America. It is composed of the following ten chapters: The Achievements of the Ancient and Medieval Worlds; Portuguese Voyages of Discovery; Spanish Voyages of Discovery; The North Atlantic; Results of the Discoveries; The Portuguese Empire in the Indian Ocean, Africa and Brazil; The Spanish Empire in the New World; The Challenge to the Spanish and Portuguese Monopoly of Discovery and Empire; Colonization and Empire in the Seventeenth Century; and The Old Colonial Empires in the Eighteenth Century. Indexed.

JONES, E. S. *Growing Spiritually.* New York 11: Abingdon-Cokesbury Press. 1953. 378 pp. $1.50. In this book of 365 daily devotional readings, the author tells how you can be that "creative and growing person"—how you can become spiritually mature. Step by step he shows how to cast aside anxiety, fear, worry, resentment, jealousy, egocentricity, and bondage to "the herd"—and how to fill your life with love, peace, joy, good temper, kindliness, fidelity, generosity, adaptability, self-control, and fellowship. With keen insight into the relationship of our spiritual, physical, and mental natures, he shows how increasing spiritual maturity can bring about better bodily health, greater poise and peace of mind, and happier day-by-day relations with your fellow men.

KANTOR, MacKINLAY. *God and My Country.* Cleveland 2: World Pub. Co. 1954. 128 pp. $2. The author portrays a scoutmaster in a small town in a role as vital as the greatest of schoolmasters. In it is Lem Siddons who gave forty years of his wisdom, the fund of his laughter, the knowledgeable touch, the sweetness and love that were his to generations of Boy Scouts. Not every boy who passed khaki-clothed along his life won the world's respect or the scoutmaster's pride. There were some misfits, fallers-by-the-wayside—sure. But Lem Siddons knew his reward every waking moment of his life and in his dreams as well.

KING, JULIUS. *Telling Trees.* New York 16: William Sloane Associates. 1954. 127 pp. $2. More than a hundred common trees of America are described and illustrated in this handy little book. East Coast, West Coast, all around the country, these are the trees you see most often. The pleasure of identifying them—in winter or in summer—is yours. The main portion of this book deals with trees in summer in full leaf, but for those who wish to pursue the mystery of tree identification in the winter, Rutherford Platt's valuable key to trees in the snowy season is reprinted in full. This book was written for people who like to go into the woods and who want a definite answer to the question "What tree is that?" Pictures and text are designed to supply the answer quickly and accurately. And everything that does not help to identify a tree has been eliminated. Leaves, needles, cones, flowers, and fruit are all beautifully pre-

sented. And behind each illustration is a background scale—in square inches—to help in the determination of size. On each page a map shows the geographical location of the tree. In addition, brief, non-technical descriptions point out the salient features of each.

KOSLOFF, ALBERT. *Mitography*. Milwaukee 1: Bruce Pub. Co. 1954. 144 pp. $3.25. The most versatile and adaptable of all the graphic arts is mitography or silk screen process printing, since it is a method which can print on any surface, any material—wood, cloth, and plastic included—and any shape with great facility. It is an invaluable supplement to the other graphic arts processes. Thus, the importance of screen process printing to the vigorous life of expanding America is incalculable. In this volume a highly respected graphic arts authority presents a basic and comprehensive work on this newest of printing processes. Here silk screen process printing is introduced for the first time under an original name, *mitography*, coined from the Greek *mitos* meaning "threads" or "fibers" and *graphein* meaning "to write." The author uses the new term to put an end to confusion arising from present terminology because *mitography* conveys the complete meaning in one word, is easy to pronounce, and can be easily translated into other languages.

While the book covers all types of screen process printing, even the more difficult phases such as halftone printing and photomitography, its approach is simple and understandable, making it ideal for use as a reference book for tradesmen as well as a text for novices in the field. Its coverage ranges from preparation of handmade equipment and use of machines to information on inks, screen fabrics, drying, and imprinting on various surfaces and materials. Methodical in organization, the book proceeds from the more simple phases to the highly complex processes. The final chapter deals with development and organization of shops, routing of work, services offered, and mechanization. The complete history of mitography is also given.

KOUWENHOVEN, J. A. *The Columbia Historical Portrait of New York*. Garden City, N. Y.: Doubleday and Co. 1953. 550 pp. (9" x 10½") $21. As the title implies, this volume is a portrait of New York City. It is a mosaic of pictures, reaching back into the city's very beginning. These pictures with their descriptive text tell not only how New York City looked as it has grown and how its personality has developed, but also the different ways people have had of looking at it through these years of growth and transition. It is a record that has been made of almost three centuries of artists and photographers. For the most part, these pictures show not how it actually looked but rather how these artists saw it, how they wanted it to look, or how they thought others wanted to see it. The first real pictures about New York City didn't appear until 1831.

In this book the author tries an experiment—he presents the text in two different dimensions—for those who read on the run, there is the commentary that follows the top of each page, telling about the attitudes and personality of each period considered in the pictures on that page. For the more leisurely reader there are the more complete captions to the pictures themselves which tell when, where, how, and why they were made. The pictures were selected from literally millions of paintings, prints, drawings, and photographs—many of which are published for the first time in this book.

LANDIS, P. H. *So This Is College*. New York 36: McGraw-Hill Book Co. 1954. 215 pp. $3. Adjustments inevitably must be made when the pupil transfers from the high-school to the college scene with its intensified social and scholastic competition. These necessary adjustments are most easily made if the pupil is aware of their universality—if he realizes that his problems are neither unique nor abnormal. This book gives counsel to aid college freshmen and senior high-school pupils in gaining assurance and self-confidence. Based on the experience of more than a thousand pupils, it is practical, simple, and challenging. Here is a book which cuts across the usual course

divisions, for it is equally suitable for use in courses in orientation, applied psychology, personality adjustment, social psychology, introductory sociology, and introductory psychology.

LEARY, FRANCIS. *The Swan and the Rose.* New York 36: A. A. Wyn. 1953. 320 pp. $3.50. This is a novel of the last flame of medievalism in England, and of the final bloody battles between Red Rose and White, between the Lancastrians of a dying order and the iron-gloved opportunists of York's new monarchy. Young Arthur Adair, a river boy in the fermenting London of 1471, joins the Rose of Lancaster out of devotion to the doomed cause of chivalry. Arthur follows the Red Rose from the first trumpet on a white morning in March to the black banners of Tewkesbury three months later. Like soldiers in all wars, Arthur comes to realize the savage irony of battle and the betrayal of belief in times of steel and blood. The lad's best friend is cut down in the treacherous mist of Barnet; his French sweetheart becomes the prey of York's daggerman; his pride and faith as a free-born Englishman bring him to the ruin of Tewkesbury. After that clash comes the tragic night of Lancaster and the martyrdom of King Henry—with Richard of Gloucester the triumphant sword of the new regime.

LEE, E. G. *Christianity and the New Situation.* Boston 8: Beacon Press. 1953. 157 pp. $3. Something new and creative is emerging from the fact that today the practicing Christian and the practicing non-Christian live side by side in the same communities without animosity. Christianity is living in a secular world, deriving benefits from it and providing benefits for it. On the long tapestry of history, there is a new situation; and the author finds it full of promise. When the historic facts of Christianity are interpreted so as to give a meaning appropriate to the age in which we live, it becomes clear that the ancient grudge between religion and secularism really exists no longer. The secularist is not irreligious, as artists and poets have stated. The division comes when people confuse a religious culture—the special dogmas of a sect—with the essence that is religion. "It is culture that makes war upon another culture, not religion upon another religion," says Lee. The author writes as a Christian Theist. He examines the "new situation" against the background of history; he discusses the nature of symbol, the nature of man, the nature of God.

LEONHARDY, ADELE, and ELY, V. B. *Mathematics for Everyday Living.* New York 3: D. Van Nostrand Co. 1954. 480 pp. $2.96. This new text presents a course in general mathematics that can be taken to advantage by every high-school pupil, whether or not he is enrolled in the conventional high-school mathematics curriculum. It was written with two principal objectives in mind: (1) To enable pupils to handle intelligently the mathematical aspects of the ordinary problems of everyday living that they are now meeting as pupils and will have to face as adults; and (2) To provide pupils with the opportunity to review the arithmetic skills essential to the solution of these problems. To accomplish these objectives the text is organized into three parts. Part One considers the many applications of mathematics in the lives of the average American. Budgeting of both time and money, good buying techniques, managing a bank account, borrowing money, sound savings and investment plans, the problems related to taxation, and spending for recreation are only some of the subjects included in its chapters. Part Two contains a complete review of the basic arithematical operations performed with whole numbers, fractions. mixed numbers, decimals, and per cents. Rules for each operation, fully worked-out sample problems, and hundreds of practice exercises help the pupil to master those skills with which he is having difficulty. In Part Three there are additional practice exercises to provide further review or to serve as diagnostic tests with which to discover pupil weaknesses. This organization permits great flexibility in the use of the text and makes possible its adaptation to many different types of courses.

LEYSON, B. W. *Man, Rockets, and Space.* New York 10: E. P. Dutton and Co. 1954. 188 pp. $3.50. This is a factual account of the latest developments and experiments by the U. S. Government on rockets, space travel, and the possibilities of interplanetary communication. There are no facts in this book which have not been thoroughly documented, and the plans for the conquest of space are those of Dr. Wernher von Braun, technical director of the Red Stone Arsenal at Huntsville, Alabama, and one of the originators of Germany's V-2 rockets. It is a book which should interest many readers. There are illustrations of the latest Government developments—a number of these recently released for the first time from the security list. Here, too, are the reports of the Skyhooks which carry the instruments into the high altitudes to give us all the data for rocket ships; here is the wonderful story of the WAC Corporal Rocket which rode pickaback on a V-2 and continued to an altitude of 240 miles. Here is the Viking, 48 feet long, which cost $200,000 each. But most exciting of all, the author gives us in detail Dr. Wernher von Braun's plan for establishing an orbiting station in space, like a great doughnut, which Braun believes can be assembled in space some 1,075 miles from the earth to dominate the world. Here, also, are the drawbacks to the plan as seen by U. S. experts.

LIVINGSTON, HAROLD. *The Coasts of the Earth.* Boston: Houghton, Mifflin Co. 1954. 35c paperbound; $3 hardbound. This is a novel of the American volunteers who flew for Israel.

LOCKRIDGE, FRANCES and RICHARD. *Curtain for a Jester.* Philadelphia: J. B. Lippincott Co. 1953. 222 pp. $2.50. Here is the man *you've* always wanted to murder—the life of the party and irrepressible practical joker who dishes out rubber hot dogs, exploding cigarettes, trick highball glasses that leak, and realistic snakes. That was Byron Wilmot, the proprietor of the Novelty Emporium, which sold gadgets for practical jokers and had as a motto: "Anything for a Laugh." The ends to which Mr. Wilmot would go for a laugh were demonstrated at a party in his penthouse on the night of April Fool's Day. This event culminated in an elaborate hoax when a body fell off the roof, arousing Pam and Jerry North, who lived below. It turned out that the "body" was that of a mannequin with red hair.

LOCKWOOD, A. G., and STANTON, N. E. *How To Finish Your Attic and Basement Yourself.* New York 16: M. Barrows and Co. 1953. 279 pp. $3.50. Here is a book for the man who has done little or no carpentry and finds himself confronted by a wife who wants the attic finished or the basement—or both. Here is a book for the man who claims he's never held a hammer. Here in conversational, everyday language with no technical terms, the week-end handyman is told how to do all the things the professional must do when you pay him to convert your attic or basement into new roomy quarters. And here, too, is the know-how on saving time, money, and materials. It is assumed the reader knows the difference between a hammer and a saw, but nothing else is taken for granted. The procedure of transforming storage space into living space is explained, step-by-step, in 23 fact-packed chapters. There are 135 illustrations to give the amateur carpenter additional "this-is-how-to-do-it" guidance. While this book is written primarily for the home owner, teachers of industrial arts or vocational education will find this book a useful instructional aid for his pupils.

LONG, E. L., JR. *Conscience and Compromise.* Philadelphia 7: Westminster Press. 1954. 166 pp. $3. This is a book to help people to apply the demands of Christian faith to the decisions of everyday life. According to the author, neither pure legalism nor blind dependency on faith will satisfy man's need for a pattern to follow in making Christian choices in life. He suggests instead a basic set of understandings derived both

from the gospel and from a knowledge of secular society—a pattern by which the Christian, in the midst of today's harsh reality, can relate his faith to concrete ethical decisions. The author describes how such a pattern can be formed, how it must be based on Christian love, and how the Christian is faced with the necessity of living by his faith without trying to escape from the culture of which he is a part. He suggests that it would be wise for the Church to develop specific "middle axioms" to guide individual and group choices. He warns against accepting these axioms as ultimate goals, however, and advocates their application simply as workable principles.

LUMB, S. V. *A Short History of Central and Southern Africa.* New York 22: Cambridge Univ. Press. 1954. 128 pp. $1.25. This is a textbook written for use in high school. The study is divided into fifteen chapters, titled as follows: Inhabitants of Central and South Africa; Outside Events and Cape Colony to 1815; 1820 Settlers and the Great Trek; The Emancipation of the Slaves; Africa Exploration in the Nineteenth Century; Christian Missions; Outside Events and Federation Schemes in South Africa; The Founding of Rhodesia; Matabele and Mashona Wars; The Union of South Africa; Cecil Rhodes and the Expansion of Cape Colony; The Development of Southern Rhodesia; North Rhodesia and Nyasaland; Central Africa: Social and Economic Progress; Central Africa: Federation Proposals and the Future.

LYNIP, R. G. *Great Ideas of the Bible.* New York 16: Harper and Brothers. 1954. 286 pp. $2.75. "The Bible can serve its purpose in this modern world only if it is understood," wrote the great teacher, Ira Maurice Price. This book lifts the central, eternally true ideas of the Bible from their archaic origin and brings them into clear focus for every reader. That the need for such a book has been a vital necessity was evident in the results of a questionnaire submitted to a cross-section of high-school boys and girls. Seventy-three per cent of the replies received indicated genuine concern about the meaning of the term God, and 68 per cent expressed urgent need to understand the teachings of Jesus. Parents, too, almost without exception voiced a definite need for such a book for themselves as well as for their children. The author has adopted an arrangement by ideas as best suited to contemporary needs. Her own introductory material sets the stage for a reading of carefully arranged Biblical passages on the themes here considered: *The Nature of God and Man, The Meaning of Right and Wrong,* and *The Ideas of Jesus* about human nature, love, happiness, wealth, power, and abundant life. (Volume II, to follow within a year, will present other themes.) The famous translation by Dr. Moffatt is employed.

MACNAUGHTAN, DONALD. *The Moon Children.* New York 1: Vantage Press. 1954. 87 pp. $2.50. All boys and girls want to take a trip to the moon. Phil and Jane show the way—and their adventures are sensational. After a strange night ride, Phil and Jane find themselves up on the moon—in the Orange Empire, to be exact. It is a very surprising place. This is a tale filled with spirit and suspense. Phil's strategy in organizing for battle, and Jane's bravery in participating will find ready sympathy in imaginative young readers, who will feel that they are right there, too.

MALAPARTE, CURZIO. *The Skin.* New York 22: New American Library of World Literature, 501 Madison Ave. 1954. 288 pp. 35c pocket edition. A revealing picture of war's effect on the conquering and the conquered.

MASON, HOWARD. *The Red Bishop.* New York 17: William Morrow and Co. 1953. 251 pp. $2.75. A wild chase through Europe, a castle by the Rhine, some very fancy corpses indeed, a racing columnist who suddenly finds himself a Peer of the Realm—these are the unlikely ingredients in a novel that is at once lighthearted and hair-raising. It all begins with the Red Bishop, a tiny chess piece that opens the door

to murder, wealth, romance; that leads to the fantastic surprise in a German castle; that ends with a bold, exciting climax.

McCART, S. W. *What Every Person Should Know About Jury Trials.* New York 1: Vantage Press. 1953. 78 pp. $2. Trial by jury is the most equitable system of justice the mind of man has ever devised. Guaranteed by the Bill of Rights, it constitutes the strongest safeguard of the individual's rights in a democracy. But it has a weakness, as have all laws administered by men: it is effective only as jurors make it so by an understanding of their role. Yet incredibly little attention has been paid to educating citizens for this vital function. Step by step, the author takes the reader through a typical trial. He explains how a jury list is selected (including a so-called blue-ribbon jury), and the manner in which his fitness to serve in a particular case is determined; how and when he should *not* serve, and what to do about it. This book not only contains all the layman needs to know about trial law, it also gives valuable suggestions from a psychological viewpoint: how to evaluate the testimony of witnesses, the lawyers' summations, the judge's instructions.

MEAD, MARGARET, and CALAS, NICOLAS. *Primitive Heritage.* New York 22: Random House. 1953. 622 pp. $5. The behavior of man in primitive society, with all his varied customs, rituals and taboos, comes under the scrutiny of the world's foremost anthropologists in this volume. By fact and speculation, by exploration and discovery, by description and interpretation, the folkways of extinct and vestigial cultures are revealed to us by writers able to illuminate scientific data with accounts rich in insight and imagination. In this most representative of anthropological forums, they discuss the myths and realities of vanishing civilizations and social organizations. Marriage customs alien to Western experience are vividly reported. Social habits, forms of art, the daily routine, and what primitives considered the amenities of living are revealed. Exotic ceremonies and a variety of primitive religions are described. Evidence of inversion, masochism, and other sexual deviations in tribal culture is examined and evaluated; feats and sacrifices are explained, and the conduct of war and the protocol for making peace in older societies are reported in essential detail. Appraisal of attitudes toward death and belief in immortality among primitive peoples brings the organization of this comprehensive survey of the great adventures of anthropological research to a logical and dramatic conclusion. In its entirety and in each of its sixteen parts, this book provides the general reader with a field trip through the world of anthropology under the guidance of distinquished scientists and writers who have devoted their lives to the study of man's role in remote cultures.

MICHENER, J. A. *Sayonara.* New York 22: Random House. 1954. 245 pp. $3.50. This is the love story of an American airman and a Japanese girl. Major Lloyd Gruver, son of an Air Corps general, and a leading ace in the Korean war, was engaged to an American girl and bitterly opposed to Japanese-American fraternization and intermarriage, so much so that he tried to prevent the marriage of one of his men, Private Kelly, to the Japanese girl whom Kelly genuinely loved. Then Gruver met Hana-ogi, a Japanese actress, and fell in love with her. The story of their relationship is not only a poignant romance in the legendary style of the Madame Butterfly classic, but a timely commentary on a problem which faces many American men stationed in Japan. *Sayonara* is pronounced Sigh-o-nara. The author, at the present time on another journey to the Orient, is working on a new project which will be a departure in form for him. A book on classic Japanese prints, it will be illustrated in both color and black and white, and contain full explanatory text by Mr. Michener on the history and significance of each print, as well as information about the artists. The author's interest in the subject of Japanese art is evident in this book, in which a famous print figures symbolically.

MILLER, J. R. *In Green Pastures.* New York 17: Thomas Nelson and Sons. 1954. 243 pp. This book is a collection of carefully selected daily devotional readings written by Dr. Miller. Short readings are provided on almost any topic or problem dealing with everyday living.

MILLER, W. H. *Pioneering North Texas.* San Antonio, Texas: Naylor Co., 918 N. St. Mary's St. 1953. 323 pp. $4.50. In an effort to secure a more intimate understanding of pioneer life, the true story of the author's own family—the Millers—is told here in detail against a background of historical content. It was the presidential election year of 1844, and immigrant trains were moving southwestward toward the young Republic of Texas. Although Texas had requested admission to the Union in 1836, its petition had only added fuel to the national controversy over the admission of slave territory, and annexation had been defeated. Among the emigrants to the hoped-for land of peace and plenty—the land of beginning again—were patriarch Ebenezer Miller, his wife Nancy, their son Jesse, his wife Mary Ann, and their five children. The tragic death of Jesse at the hands of an assailant armed with a bowie knife is stirringly pictured and the account of the trial of Jesse's son, George, who avenged his father's murder, transports the reader, with startling reality, to scenes of suspense and heartbreak. Life for the pioneer was fraught with many hardships—Indian massacres and depredations, droughts, cattle thieving, white men renegades and army deserters, political intrigue, and the hovering black clouds of the Civil War. But, despite the dangers and privations, the early settlers "had the initiative to take it on their own; they had the courage to fight back; they had the intrepidity to risk their lives—if need be, to die—in the effort to secure that condition of life to which they felt themselves entitled." Of such stern stuff were made the colonists who blazed the trails to our present-day civilization.

MORGAN, W. D., and LESTER, H. M. *Graphic Graflex Photography,* 10th edition. New York 17: Morgan and Lester, 101 Park Ave. 1954. 430 pp. $6. An entirely new version of the well-known *Graphic Graflex Photography* is now available. First published in 1940 and used since by schools, colleges, armed forces, and over 100,000 individual photographers, the book has now been entirely rewritten. In a new and comfortable format, the book now contains 432 illustrated pages, including 16 pages of color pictures. The completely new text was prepared by the editors in close collaboration with 18 eminent contributors. "Choosing a Lens," "Using a Lens," and "Shutters and Synchronization" are three feature chapters which will be of especial value to all photographers. These chapters cover such subjects as lens types and characteristics, useful lens data, practical information on shutter functions—construction, operation, shutter types, shutter speeds, light transmission and action-stopping power, flash synchronization —and dozens of other topics of current photographic interest. Other equally important chapters are: The Law and Pictures, Photography in Crime Detection, Nature Photography, Photography in Industry, Graflex and Graphic Equipment, A Guide to Picture Making, Exposing the Negative, Using Filters, View Cameras, and many more—a total of 19 chapters, each by a specialist in his chosen field.

MORRIS, LLOYD. *Curtain Time.* New York 22: Random House. 1953. 397 pp. $5. For reading enjoyment it would be hard to find a better book than this, the story of the theater in America, from 1820 to the present day. Here are the celebrated players of the past; here are the famous theaters, starting with the frontier playhouses and the old Park and Bowery Theaters in New York; here are the visiting stars, the glamour girls, the great days of Broadway. Among those present are: Edmund Kean, Wallack, the Booths, James H. Hackett, Fanny Kemble, Forrest, Charlotte Cushman, Modjeska, Bernhardt, Joe Jefferson, Mansfield, Julia Marlowe, Mrs. Fiske, William Gillette, Clyde

Fitch, Maude Adams, John Drew, the Barrymores, Weber and Fields, George M. Cohan, Ziegfeld, Katherine Cornell, and Lunt and Fontanne.

MULGRAVE, DOROTHY. *Speech.* New York 3: Barnes and Noble. 1954. 288 pp. $1.50. Because of the varied purposes of the book, the subject has been divided into two parts, which may be used together or independently depending upon the program of study which is desired. Readers interested mainly in the speech arts will find chapters on the use of words, public speaking, group discussions, argumentation and debate, and oral interpretation; these chapters (though fully cross-referenced) are so designed that they may be studied in any chosen order. Readers concerned especially with the speech sciences will find a concise but comprehensive treatment of the anatomy of speech and hearing, of voice training, and of English pronunciation. In view of the scope of the subject matter, this volume may also be used (1) as a brief and practical textbook for adult study groups; whether they are concerned primarily with public speaking, with dramatics, or with speech correction and voice production, they will find a clear statement of principles and guidance for further study; (2) as a study guide for those who are seriously intent upon improving their own speaking personalities; (3) as an encyclopedic reference book for those who may have occasion to refer to the principles of parliamentary procedure or formal debating, to engage in group discussion, or to appear on radio or television; and (4) as a comprehensive review of the field of speech for those who need a general perspective.

MURDOCK, MYRTLE CHENEY. *Constantino Brumidi, Michelangelo of the United States Capitol.* Washington 6, D. C.: Monumental Press, 1720 M St., N. W. 1950. 127 pp. (9¾" x 12¾") $10. This is the story of Constantino Brumidi who brought his glorious artistry across an ocean. It is the story of an Italian refugee who dedicated the remaining twenty-five years of his life to (as he said) "making beautiful the Capitol of the one country on earth in which there is Liberty." It was he who decorated the walls and ceilings of the U. S. Capitol. This book reproduces, many in color, many of the murals and frescoes that have attracted the attention of the thousands of people who annually visit the Capitol. Here the author tells not only of his paintings but also of incidents from his life—of his lying in his unmarked grave for 70 years unhonored and unknown. The author, a former school teacher, brings to light, through her untiring research, facts and information about a man who, despite his contribution to the country and his love for it, was practically the forgotten man. This book together with her other two books should be in every high school and elementary school—available for reading by youth and adults.

————————. *Your Memorials in Washington.* Washington 6, D. C.: Monumental Press, 1720 M St., N. W. 1952. 193 pp. (6" x 9") $3.25. The book is divided into eight main sections and an index. These are: Equestrian Statues, Mount Vernon Estate, Lee Mansion, Arlington National Cemetery, Lincoln Memorials, Folger Shakespeare Memorial Library, Thomas Jefferson Memorial, The Washington Memorials. In these divisions one learns about General Jackson, General Sheridan, General Pulaski, and other generals; about Mount Vernon, the Lee Estates and the families that lived there; about the Arlington National Cemetery, the tomb of the Unknown Soldier, and burials and memorial services held there; about the famous collections housed in the Folger Library and how they were secured; about the Jefferson memorial and the panel inscriptions in it; and about the Washington Monument, its construction, and its dedication. For the person who wishes to have a deeper appreciation of our national heritage, this book as well as the author's other books, *Your Uncle Sam in Washington* and *Constantino Brumidi, Michelangelo of the United States Capitol,* will provide delightful reading and authentic and much little known information about our great national capital.

—————————. *Your Uncle Sam in Washington.* Washington 6, D. C.: Monumental Press, 1720 M St., N. W. 1952. 192 pp. (6" x 9") $3.25. In this book the wife of an Arizona Congressman records some of the stirring background of American democracy which she has had the opportunity, during more than sixteen years in Washington, to trace in the capitol city of the United States. Herein she describes the city in general, the Capitol building, the Senate and the House of Representatives Chambers and intimate stories about them, The Supreme Court, the Library of Congress, the White House, the Declaration of Independence, the Constitution of the United States, the Great Seal of the United States, the National Anthem, Old Glory, and the American Creed. Herein are many items of interest and of historical value about which so very few people know. A companion book, *Your Memorials in Washington,* tells about the many memorials located in this famous city.

MURRAY, GILBERT. *Hellenism and the Modern World.* Boston 8: Beacon Press. 1954. 60 pp. 75c paper; $1.50 cloth. The author, probably the world's outstanding scholar in Hellenic Culture, discusses why he has "no reason to doubt that our Christian or Hellenic civilization is on the right road; certainly no reason to lower our traditional standards or abate our old courage."

MYERS, L. K. *Music Fundamentals Through Song.* New York 11: Prentice-Hall. 1954. 97 pp. $2.50. The purposes of this book are to teach music fundamentals by relating the facts of music theory to songs and to help pupils learn to read music. To provide a common background for this learning, songs are included—and are, therefore, basic to the whole plan of teaching presented here. Once these songs have been learned *by rote,* they are used to establish the correct concepts of the sounds of certain basic groups of tones, to develop the sense of rhythm and a feeling for the relative values of notes, and as a source of the facts of theory. In line with the practices of many modern instrumental teachers, the musical ear and the musical memory are developed so that they become aids in learning. Ability to read music is acquired by developing certain necessary skills, by learning and using facts, and by establishing a pattern of approach for reading unfamiliar material. The songs in Groups I, II, and III are generally similar. The melodies contain diatonic scale passages and fundamental chord tones, and can be learned in any sequence since they have no special relation to the technical subject that precedes or follows. They are grouped arbitrarily for ease in referring to material. The songs in Group IV contain accidentals and are deliberately placed farther back in the book to suggest that they be learned *after* certain other basic concepts of tonal relationships have been established.

MYGATT, E. D. *Stand By For Danger.* New York 3: Longmans, Green and Co. 1954. 192 pp. $2.50. David and Stuart Hamilton and Ned Osgood persuade Pelican to come East with them after the summer vacation on the ranch and enroll in the Abbott School. As they enter the campus, however, Pelican is not at all sure that an old cow-poke like himself can adjust to prep-school life. Pelican swaps his cowboy clothes for more suitable apparel, but other adjustments are more difficult. Oliver and his gang try to make it hard for the "hick" and when Pelican retaliates a feud is on.

NEILL, ROBERT. *Rebel Heiress.* Garden City, N. Y.: Doubleday and Co. 1954. 314 pp. $3.95. It was the beginning of the Restoration in England. Charles II was on the throne. The Royalists had returned to recover their estates, to salvage their lost pride—and perhaps to take their revenge. Deep animosities and lost fortunes still unsettled the land, and some young gentlemen turned vagabond and thief, while others tried to live side by side with the Rebels. Richard Carey and his hotheaded comrade, Sir Giles Orton, returned from the Emperor's Wars to claim their birthrights. Their

first night in England at the Royal Oak Inn boded no good for the young men—a mysterious Mr. Rivers arrived in the night and gamed away Sir Giles' small fortune, and the innkeeper's blandness could not conceal his air of evil. Richard, putting his fears aside, rode off early the next morning to wrest his father's estate from the Rebel Colonel Paget. With sword bared he was ready for anything—anything, that is, but the two beautiful sisters who stood waiting for him, one tall, blond, and arrogant; the other dark-haired and gentle. These were Richard's Rebel enemies—Anne and Barbara Paget.

NOBLE, HOLLISTER. *One Way to Eldorado.* Garden City, N. Y.: Doubleday and Co. 1954. 286 pp. $3.50. Howard Bierce, trouble shooter for the Mountain Division, slipped quietly off the train that was carrying him to New York, into another world. It was the stormy world of Pioneer Gap, a desolate flag stop 8,000 feet up on the Great Western's stretch of high iron over Eldorado Pass. In the worst winter Howie could remember—a winter when the blizzards were so powerful that the choking snow seemed to be boiling up out of the valleys below—the Gap harbored an oddly assorted band of people. As Howie fought raging storms to keep the heavy Diesels rolling over Eldorado Summit, he was pulled into the equally violent tempest of emotions that held that small group together at the Gap, and learned—too late—what it was that had attracted a musician, a small-time miner, a big-time gambler, and a dangerously beautiful girl to the desolation of the Gap. There is romance and suspense in this novel, and the story of a great railroad operating through the mountains in spite of blizzards, avalanches, and man-made destruction.

PACE, M. M. *Home Is Where The Heart Is.* New York 36: Whittlesey House. 1954. 192 pp. $2.50. This is the story of Brady Allen and of how she found a home and romance with the bewildering, lovable Marstons. When Brady's father left the mountain and went off to look for work, he left Brady to live with the Marstons in their rambling farm called The Houses. And to Brady, coming from a small cabin, it seemed that perhaps she would never belong to this strange, wonderful household. She could scarcely accustom herself to mornings in the family classroom, to sitting at the long kitchen table piled with good food, to sharing with Sally the deep feather bed under the eaves. Secretly she feared that when Judge Marston returned from his circuit, he might not even want her. But Brady had a loving heart, and with each day she became more a part of The Houses. It was Brady who delighted little Fernie's heart at Christmas. It was Brady who sat long hours spinning with Granny. It was Brady who kept the secret that made it possible for Miss Nell to run off and marry Trink. And it was to Brady that Bob turned when he needed help in hiding the outlander, the railroad man whom Sally loved, but whom the Judge forbade at The Houses.

PATMAN, WRIGHT. *Our American Government.* New York 36: Bantam Books. 1954. 320 pp. Paperbound. 35c. Junior and senior high-school jupils will find the answers to more than 1,000 pertinent and provocative questions about their government and how it operates in this book. A special *Teacher's Guide* is available without charge. Books are available in classroom quantities at special educational discounts. Written by a Congressman the text offers an array of information for civics and American government classes and teachers. The publishers have provided seventeen special explanatory charts designed for use with an opaque projector. These charts are also available as 2 x 2 slides, supplied at cost. The book points out in thought-provoking question-and-answer style just how the divisions of government operate, the way in which power is derived from the people, how laws are made and enforced; and answers hundreds of other questions about the practices and philosophies that make up the fabric of our government. Eight sections of the text discuss Democracy and Its American Sources; Political Ameri-

cana; The Constitution; The Congress; Executive Departments; Independent Offices, Agencies, and Establishments; The Judiciary; and The States.

PRABHAVANANDA, SWAMI, and ISHERWOOD, CHRISTOPHER, translators. *Bhagavad-Gita: The Song of God.* New York 22: New American Library of World Literature, 501 Madison Ave. 1954. 144 pp. 35c. This is the epic of the Hindu faith which daily inspires the lives of millions throughout the world.

QUALBEN, L. P. *A History of the Christian Church.* New York: Thomas Nelson and Sons. 1953 (14th printing). 654 pp. This book presents a synoptic view of the history of the Christian church so that the reader may understand how the church has been a chief factor in the development of civilization as we know it today. Four main divisions of Church history are presented: (1) the organic relation between Christianity and the Old Testament religion, (2) the formative period of the Early Church, (3) the underlying principles of the Reformation and the Counter Reformation, and (4) the development of American Christianity. Here one gains an understanding of what the various church bodies in America stood for and what role they play in national and world affairs. Indexed.

ROGERS, MATILDA. *Flower Arrangements.* New York 22: New American Library of World Literature, 501 Madison Ave. 1954. 192 pp. 25c pocket edition. An illustrated guide telling and showing how to add new beauty to life in and about the home and elsewhere—practical suggestions for design, proportion, harmony, and variation.

ROMOLI, KATHLEEN. *Balboa of Darién.* Garden City, N. Y.: Doubleday and Co. 1953. 447 pp. $5. A magic quality—an aura of romance, a suggestion of legend—surrounds the name of Darién, the first mainland colony in the Western Hemisphere, and that of Balboa, the conquistador whose destiny was interwoven with its brief life. In 1510 Vasco Núñez de Balboa, a handsome, devil-may-care Spaniard, set out for immortal glory concealed in a flour barrel on a ship bound for the mainland. He was among the rugged *companeros* who founded Darién; it was his leadership during the colony's early, difficult years that made Darién a crucial link in the chain of empire and exploration, and it was his discovery of the Pacific that has given both Balboa and Darién immortal fame.

ROSBOROUGH, M. F. *Don't You Cry for Me.* New York 16: Thomas Y. Crowell Co. 1954. 255 pp. $3. It is dangerous for a man to dream, if he is in a hurry; and Jump Williams, returning to the Florida backwoods after the war, is obsessed by a vision of land of his own and a golden-haired girl to share it. An airplane ride over the Suwannee River helps Jump form an unusual plan. By salvaging giant cypress logs he has seen in the river's depth and selling this rare and valuable lumber, he hopes to earn enough money to buy the farm he so strongly desires. His girl, True Martin, grown now into a bewitching young woman, shares his hunger for security. Her father is a drifter, always on the move like the clouds that trail their shadows over the pine woods. True wants a real home, with a white mailbox at the gate.

ROSSITER, HARRIET. *The Twins' Birthday Surprise.* New York 1: Vantage Press. 1954. 46 pp. $1.75. Ketchikan, Alaska, is the setting, and Pinky and Goldie are a pair of charming hamsters, the real hero and heroine of this book. Jed and Jean, eight-year-old twins, just moved to Ketchikan from their home in the States, find themselves a trifle lonely, for they have just started to attend the Ketchikan school and have not as yet made any friends. Here is where Pinky and Goldie take over.

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literary greatness, an appreciation of the construction, style, and psychology of Saint Genest, and in some detail contrasts it with Polyucte.

SALVEMINI, GAETANO. *Prelude to World War II.* Garden City, N. Y.: Doubleday and Co. 1954. 519 pp. $7.50 This analysis of European relations between two wars may become a landmark in the study of contemporary diplomacy. The author focusses his attention on Italy, which played a crucial role in beginning on World War II. The book begins with Mussolini's seizure of Corfu in 1923 and ends with the fateful events of 1936, when the stage had been set in Ethiopia and Hitler was standing in the wings. The author's conclusions will shock many American readers, for the book is full of unorthodox interpretations of the personalities who played major parts in shaping the tragic conclusion that followed. The figures of Laval, Hoare, Eden, Blum, Hitler, Haile Selassie, Stalin, Roosevelt, and Churchill—some of them emerging in a new light—are studied by the author as he guides the reader through the labyrinth of European diplomacy. He reassesses the heartbreaking history of the League of Nations—a story of deception, fraud, and procrastination. While the European public built their hopes on League government, the statesmen of France, Britain, and Italy were determined to bypass it, using the League as a screen behind which to carry on their divergent policies.

SCHNEIDER, HERMAN and NINA. *Rocks, Rivers, and the Changing Earth.* New York 11: William R. Scott. 1952. 189 pp. $3. This book was planned and written to help pupils learn to read the story of our earth, beginning with the part of it that is right around us. It will turn even a walk in the park into an exciting voyage of discovery. As pupils do the experiments they will get an understanding of the forces that lift up mountains and make and unmake the land and sea of our changing earth. After they have read this book, they will see the earth in a new way—as it was millions of years ago, as it is today, and as it will be millions of years from now.

—————————. *You Among the Stars.* New York 11: Wm. R. Scott, Inc. 1951. 60 pp. (7¾" x 9½"). In this beginning book about the universe the authors, in the familiar terms of a post-card, a rubber ball, a merry-go-round, help the reader to see the order behind the apparent aimlessness of empty space. Through these simple objects, he can feel and understand the fixed and steady circling of the sun, moon, and stars in their cosmic merry-go-round. Useable for the slow reader in the junior high school.

SCHOONOVER, LAWRENCE. *The Spider King.* New York 11: Macmillan Co. 1954. 403 pp. $3.95. In this book, the author has returned to his favorite period and locale, 15th century France. Feudal society was corrupt; the world was terrified by a hideous new weapon of war; and France was surrounded by enemies. But the deadliest of Louis XI's foes, superstitiously dreaded at the time but now well known to medical science, was a secret malady which he feared might strike him at any moment and change him from the craftiest of monarchs into a guileless, trusting simpleton. It is historically true that during the most critical negotiations of his reign he was acutally so transformed—an episode the author treats with skill and understanding. This book is basically genuine biography, tracing the king's ultimate triumph and the founding of the first truly modern national state.

SIMPSON, ALYSE. *Red Dust of Kenya.* New York 16: Thomas Y. Crowell Co. 1952. 288 pp. $3.50. This is an autobiography of a young bride who followed her husband into the desolate wastes of Central Africa. Alyse Simpson had been born and raised in the lush, peaceful valleys of Switzerland. Her childhood sweetheart Marti offered her a neat white house by a waterfall and a lifetime of security in those familiar green meadows. But it was John, a lean young Englishman with a pioneer's vision, who won her love; and when he asked her to marry him and make their new home in the

barren Saltlick valley of Kenya, she did not hesitate. On the one thousand lonely acres of their Kenya farm, Alyse and John struggle, amidst the constant threats of savage weather, locusts, and wild jungle life, to wring a living from the dusty soil. For John there is serenity of mind and tenacity of purpose in attempting to conquer this parched earth. But Alyse, in her primitive clay hut with its paneless windows and mud floor, dreams of her youth and yearns for the pleasant days of her childhood. Beneath the vast empty African sky, her recollections of the familiar ways of home throw into strong contrast a tranquil Swiss village and the awful solitude of a Kenya farm.

SKINNER, C. O., and KIMBROUGH, EMILY. *Our Hearts Were Young and Gay.* New York 10: Globe Book Co. 1954. 273 pp. $2.40. This is the story of two American girls just out of college traveling through Europe. They go from one astonishing experience to another. Due to its unusual appeal to young people, the Globe Company has released the story in a special edition for high-school use.

SMITH, L. B., and BARRETT, JEAN. *The House Is Still.* Boston 20: Christopher Pub. House. 1954. 74 pp. $2. This three-act play is a story enmeshed in the experiences of a humble American home caught in the grip of war in which the three great adventures of living—Life, Love and Death—are depicted. It is the portrait of Lieutenant Bill Harrison, a lovable college lad who thought he had the world at his finger tips. He loved life and all that was a part of it. Then came World War II; and the house where joy, hilarity, and gayety reigned was silenced. A Christmas background is interwoven in the plot as the theme lends itself to the Yuletide season and challenges any dramatic group that wishes to produce a worth-while play during the Christmas season. The playwrights have long felt the need for good Christmas plays, and they have adapted the play to this end.

SOOTIN, HARRY. *Michael Faraday.* New York 18: Julian Messner. 1954. 190 pp. $2.75. This is the life story of one of the leading scientists of the last century whose experiments led to the development of the dynamo, the electric motor, and to an industrial revolution. Michael Faraday, son of a blacksmith, was apprenticed at fourteen to a bookbinder in whose shop he gained most of his education and acquired an interest in science—from the *Encyclopedia Britannica.* That interest changed and dominated his entire life, and led from errand boy to Fellow of the Royal Society. Today his laws of electrolysis are part of every modern textbook in chemistry and physics, and the unit of electric capacity, the Farad, was named for him.

STARKIE, WALTER. *In Sara's Tents.* New York 10: E. P. Dutton and Co. 1953. 349 pp. $6. Many myths surround gypsy beginnings, and the title of this book and much of its framework come from the original myth of all. Sara, an Egyptian, came sea-born as a hand-maiden to the two sisters of the Virgin Mary, Sainte Marie-Jacobe and Sainte Marie-Salome. The legend is that the family of Bethany (these two sisters plus several others) arrived in the year 42 A.D. and settled in Provence. Gypsies do constitute one of the mysteries of the human race. They are always themselves at any time and in whatever country. They seem to have, as the author constantly points out, precise ways of interpreting the primary instincts of whatever country they happen to live in. They are the people of the Great Trick and of any number of lesser tricks. As in all of the author's books, this one contains many bars of music. Starkie is, of course, a fiddler, and his music and his fiddle have always been his passport to the gypsies. Largely because of their love of music and his own knowledge of gypsy music, he has been able to live with them more intimately than any other non-gypsy alive. The sections of the book devoted to gypsy music—its nature, its origins, and its influence—are important and fascinating. The music of the gypsies is as important even as the language,

for, as Starkie says, when they first trekked from East to West "they carried as their only two possessions a language and a scale." An interesting and helpful feature of the book is an eight-page glossary of gypsy terms.

STEIN, GERTRUDE. *The World's Round.* New York 11: William R. Scott, Inc. 1939. 73 pp. $2.50. In simple manner, the author tells about things in this world through the eyes of a child.

STRANG, RUTH, and ROBERTS, RALPH. *Teen-Age Tales.* Boston 16: D. C. Heath and Co. 1954. Book 1, 254 pp. Book 2, 254 pp. $2 each. These books have been written on a sixth-grade level of reading difficulty, but their level of interest parallels the maturity of high-school pupils. Because a long book produces an immediate psychological block for the slow reader and the nonreader, these books have been kept to a relatively brief format. Vocabulary, sentence structure, and sentence length have been controlled to make them easy for reluctant readers. Character interrelationships in the stories have not been allowed to become numerous or complex. The tales in these books will interest both boys and girls. Each book has five parts. In Book One, pupils will enjoy Teen-Agers Today, Science Stories, True Sports Stories, Animal Stories, and Suspense and Mystery; in Book Two, they will be just as enthusiastic about Suspense and Mystery, Science, Success Stories, Boy Meets Girl, and More Teen-Agers. Within each part, the stories run from short to longer. The slow reader starts out with a very short, interesting story. After experiencing the satisfaction of easily completing a reading assignment, he gains courage to try another. He is then on his way to overcoming his dislike of reading.

Questions are provided at the back of each book. There they are available if the teacher wants them, but out of the pupils' way while they are reading the stories. *Teacher's Manuals* are available for each book.

STRANO, N. S. *The Barriers We Create.* New York 1: Vantage Press. 1953. 243 pp. $3.50. When Danny Morelo came to the big city from the mining regions, he was coming from an environment where he had known hardship and tragedy into a wonderland of opportunity and delight. But there was another difference, too. The life he was leaving had been a brotherhood of friendship and love. When his father was killed, an Irish priest had prayed while Negro, Polish, Swedish, French and Jewish neighbors paid homage. The wonder city into which he was moving, he was to discover, was a center of bitterness and hate. Intolerance and bigotry prevailed everywhere—in office, church, and home. Danny met Anne Gailbraith when he got his first job. Almost at once, Danny and Anne were in love. The whole future looked roseate. Until—

STRATTON, KENNETH. *Understanding the Sentence.* Yonkers-on-Hudson, N. Y.: World Book Co. 1954. Book 1, 176 pp.; Book 2, 192 pp. $1.12 each. The author's aim in this two-book series is stated in the preface—to provide direct teaching of sentence-building skills, the basis for all work in language fundamentals. No attempt is made in these workbooks to cover the full language arts program as in the standard English textbook; these books emphasize reteaching and practice of the basic skills of grammar, usage, capitalization, and punctuation as they relate to the use of correct and effective sentences. Taken together, the aids to learning provide a handbook of how to write good sentences, presented so that students may apply what they learn immediately to the correction of error or the improvement of expression. The self-teaching features include clear explanations, excellent models, and strategically placed reviews—all directly keyed to ample, skillfully devised, practice material. The review pointers on grammar and usage are provided wherever important new topics are introduced, to help the student avoid grammatical snags as he builds practice sentences. Important rules are italicized for emphasis. Each part begins with a preliminary test and ends with an achievement test.

In Book 1, the principal divisions include study of *the basic sentence parts;* the functions of the *parts of speech* in building sentence units; use of *capital letters* and *punctuation marks.* In Book 2, the principal divisions deal with *variety in sentence arrangement; ways of joining parts of the sentence;* a recapitulation and extension of the treatment of *usage* in Part I, and a review and extension of the *basic sentence parts* and of *capitalization* and *punctuation.* These books will complement any modern course or textbook in the high-school English program. The books are useful at any level from grade 7 through grade 12 in situations where the individual pupil or the class as a whole shows weakness in the mastery of sentence structure. They may be used independently or in any two successive years of high school.

STRONG, C. S. *Snow King.* New York 16: Dodd, Mead, and Co. 1954. 249 pp. $2.50. Snow King, a pedigreed Norwegian Elkhound, was presented to the young Lapp herder, Magne Jenssen, as a part of the program of the American and English breeders to restore to the Lapps the herd dogs destroyed by the German invaders during World War II. Magne was particularly pleased because the alert puppy was brought to him by Lieutenant Colin Hunter, member of the U. S. Air Force, who had worked with him as a member of the super-spy Office of Strategic Service in Norway and Lapland. The story gives an appealing and dramatic account of the growth of Snow King from a wriggling, furry puppy on board a U. S. destroyer to a capable herder of reindeer for the Norwegian Lapps.

STUART, H. L. *Weeping Cross.* Chicago 4: Henry Regnery Co., 20 W. Jackson Blvd. 1954. 384 pp. $4. "Richard Fitzsimon is the young son of an Irish landowner, brave, proud, handsome, highly cultivated; from the Jesuit college he has gone to the army, but during his whole military career—in the Thirty Years War, with Prince Rupert's cavalry in England, against Cromwell's troops in Ireland—he has always been determined to return to the cloister if he comes through alive. "One winter day in 1652 he is put ashore in Boston. The death sentence on the Royalist has been reduced to ten years' penal servitude in the Colonies. His home in Ireland has been burnt down, his brother has fallen, his mother has succumbed during the fight before Cromwell's troops, the family estates are confiscated, and his father has been executed.

The Student's Macbeth. New York 10: Globe Book Co. 1954. 187 pp. $1.80. This famous Shakespearian classic has been edited and adapted for high-school pupil use by Lambert Greenawalt and Simon Hockberger. The content is set in parallel column with the actual text of the play appearing in the left-hand column. Occasionally, long and involved sentences have been broken into two or more shorter ones; unnecessary punctuation marks have been omitted and essential punctuation has been modernized; also basically British spelling has been Americanized only in the explanations.

THIRY, PAUL; BENNETT, R. M.; and KAMPHOEFNER, H. L. *Churches and Temples.* New York 18: Reinhold Pub. Corp. 1954. 318 pp. $18. This is a beautiful pictorial presentation of religious architecture. It shows the background of church and synagogue design, pointing out the requirements of present-day design and demonstrating modern planning techniques. The book is divided into four parts. The introduction traces the history of religious architecture, while each of the other three sections is devoted to the architecture of one of the three main religious groups—Catholic, Jewish, and Protestant. The book stresses the fact that our period has developed a type of religious architecture expressive of present-day needs and uses. It describes the evolution of church architecture and shows how the well-conceived modern church and synagogue is designed to fit the spiritual aspirations of religion today.

THOMPSON, MORTON. *Not As a Stranger.* New York 17: Charles Scribner's Sons. 1954. 958 pp. $4.75. This long novel tells the story of the making of a doctor. It is the story of Lucas March, "a specialized human," "a stranger in the world" who cares about one thing alone: the practice of medicine. From Luke's strange childhood, shaken by the conflict between his parents, to his establishment in small-town general practice, the story gives the substance of a dramatic life and the spirit of a dedicated man. For Luke, the central purpose—more primary than to heal or to relieve suffering—is simply to fight for life. That conviction he never loses; but after a profound experience at the close of the novel, he does come to understand for the first time that no man, whatever his mission, can stand alone in the world.

TIMM, C. P. *Mr. Pickwick.* New York 10: Globe Book Co. 1954. 272 pp. $2. This famous classic by Charles Dickens has been adapted for high-school use. An unusual amount of selective elimination has been done to the original *Pickwick Papers* in order to make them more readily understandable to those living in the middle of the twentieth century.

TOR, REGINA. *Getting To Know Germany.* New York: Coward-McCann. 1954. 64 pp. $2.50. This is the story of the ordinary things that people of Germany do every day. It tells about the games the children play at school, and what sports they enjoy on week ends and holidays. It tells you what they wear and what they eat, and about the kitchens where their mothers prepare the food. You learn about the buildings where they live, the beds they sleep in, and what they study at school. You find out what sort of songs they sing, how they celebrate Christmas and Easter, and the kinds of work their fathers do. This is also the story of special occasions, of holidays and fairs and festivals.

TRUSCOTT, L. K., JR. *Command Missions.* New York 10: E. P. Dutton and Co. 1954. 570 pp. $7.50. The outgrowth of personal experiences and observations, and written entirely by himself, the author's story reveals much that is new, fresh, and interesting about certain phases of World War II which have not been fully covered until now. It is also a frank and outspoken record of impressions and reactions to the other military leaders with whom the author served. In April, 1942, General Marshall selected Truscott to head a group of American officers who were to join the staff of Lord Louis Mountbatten. As an officer assigned to Combined Operation Headquarters, Truscott participated in the detailed work of planning raids on the enemy-held coast. He was present at the famous Dieppe Raid, he was directly involved in the organization of the first American Ranger Battalions, and he was active in the formulating of the early plans for the invasion of Europe. When the decision was made to invade Africa, Truscott was assigned to prepare the plans for the capture of Casablanca under General Patton's command, known as the Western Tank Force. And after the successful assault on Port Lyautey, Truscott's next assignment was as Deputy Chief of Staff at an advanced Command Post in the desert co-ordinating British, French, and American efforts to cut Rommel's line of communication with Tunis. When the crisis was over and the Germans began to retreat, General Truscott was given command of the Third Infantry Division under General Mark Clark. After 59 days of fighting, the Third Division was relieved and withdrawn from the front lines for a rest. The Anzio epic followed and in the midst of it General Truscott was given the command of the Sixth Corps, thus assuming the responsibility for the entire beachhead operation. Then came the most difficult period before the Allied forces were able to effect a breakthrough which led to the liberation of Rome. The invasion of France was under way from the North and a Seventh Army was formed under General Patch to support the invasion from the south. General Truscott's Sixth Corps was to serve as the backbone of this operation. Despite many

difficulties, the invasion of southern France was a complete success; Truscott was promoted to Lt. General, and General Eisenhower assigned him to organize the Fifteenth Army. However, at General Marshall's request, Truscott was returned to Italy and given command of the Fifth Army. Thus it fell to General Truscott's lot in the closing months of 1944 and in the early months of 1945 to clear northern Italy of the remaining German troops. By May 2, hostilities were over. The final chapter in General Truscott's World War II career was as Commanding General of the Third Army and Eastern Military District—a post in which he succeeded General Patton.

TUNIS, J. R. *Go, Team, Go.* New York 16: William Morrow and Co. 1954. 215 pp. $2.75. This is a story that has a lot to say about boy nature, the dangers of over-confidence, the tricky emotional qualities of communities, the rugged nature of team play in the making, in the losing, and in the winning. It is the story of a popular winning high-school varsity team that is not allowed to play by the coach because it broke training—for gambling. The B team pinch-hits and wins through, the hard way, to victory.

————————. *Highpockets.* New York 16: William Morrow and Co. 1948. 187 pp. $2.50. Cecil McDade of North Carolina, Highpockets to a million fans and right fielder for the Dodgers, was an unpopular character. He could field and run and throw and hit. The crowd liked to see him lift those long balls into the stands, but they didn't like Highpockets. His own teammates didn't like him. Why? He wasn't a team player, he was all for Cecil McDade. He was in baseball only for what he could get out of it. He didn't even like Brooklyn!

————————. *The Kid Comes Back.* New York 16: William Morrow and Co. 1946. 245 pp. $2.50. This is a baseball story and its hero is Roy Tucker. There is plenty of baseball action. But this is more than a sports story and the Kid comes back in more ways than one.

————————. *The Other Side of the Fence.* New York 16: William Morrow and Co. 1953. 224 pp. $2.50. Being young is terrible, thought Robin. My father expects me to go to Yale and be a champion pole vaulter, because that's what he did. But the one thing in the world I want is to get away. I want to go West and see something. I'm almost seventeen. I want to be on my own! Robin's father could not understand why anyone wanted to leave a comfortable home in such a lovely place. Remembering his own youth, however, he finally persuaded the boy's mother to let him take the longed-for trip. So Robin and a friend who owned an ancient Ford started off. Before them stretched the open road, unknown country. It was adventure; it was freedom!

————————. *Son of the Valley.* New York 16: William Morrow and Co. 1949. 192 pp. $2.50. The farm at Cat Creek had belonged to the Heiskell family ever since the first Heiskell crossed over from North Carolina to Tennessee in colonial times. In the 1930's young Johnny Heiskell and his family still lived there, although each year less cotton grew on the wornout land and buying enough food to stay alive was more and more difficult. But Cat Creek was home to the Heiskells. Then came the great Tennessee Valley Authority dams, and the Heiskells' farm was in a region due to be flooded. TVA would provide them with another farm, neither better nor worse than the old one, but their grief and resentment over losing their home turned into cold anger against the government and everything it stood for.

————————. *Young Razzle.* New York 16: William Morrow and Co. 1949. 192 pp. $2.50. When they called him Young Razzle, he retorted angrily, "My name's Joe—Joe Nugent! Get it?" He was a rookie second baseman in a Class D

league. His father whom he had not seen for years was Razzle Nugent, the once famous Dodger pitcher. Joe, who thought he hated his father, went in one season from Savannah to Kansas City to the Yankees. Old Raz, who had no hate at all for the son he hardly knew, was dropped by the Brooklyn club and sent back to the minors. The two first met on the diamond in Kansas City. It was the son's ugly sneer, flung at his paunchy, overweight father, that sparked Raz Nugent's comeback.

WEISER, F. X. *The Easter Book*. New York 17: Harcourt, Brace and Co. 1954. 244 pp. $3. This book presents the story of Easter in all its aspects, as it is celebrated in many countries. In addition to the liturgical background of pre-Lent, Ash Wednesday, Passiontide, Palm Sunday, Maundy Thursday, Good Friday, Holy Saturday, Easter Sunday, and the period immediately following, many nonreligious practices and traditions are explored. The early origins of such well-known customs as decorating eggs, egg-rolling, the Easter Bunny, hot cross buns, new Easter bonnets, as well as such unfamiliar ones as marble-playing on Good Friday, "heaving," "switching," and "drenching," are traced through history often to pagan fertility rites. Food plays an important part in the fast and feast of the Easter season, and here are the menus and special treats of many countries, including several recipes. Here, too, are many hymns and carols, some with the music, that are sung at Easter time by many people.

WELLS, HELEN. *Escape by Night*. Philadelphia: John C. Winston Co. 1953. 192 pp. $1.50. One of the most adventurous and exciting phases of American history springs to life in this tale of Marietta, Ohio, in the turbulent 1850's. When Evan Pierce's horse, terrorized by a slave hunter, threw his master and broke Pierce's leg, it left one of the nation's busiest underground railway stations without a conductor. Trembling slaves, escaping from Southern plantations, continued to come to the big house in Marietta, and Evan's son, young Andy Pierce, took the responsibility of smuggling them to the next station. But the rising number of escapes through Marietta drew the attention of the notoriously brutal slave hunters, and soon the Pierce house was surrounded by men who watched the family's every move. How Andy smuggled out the slaves right before the eyes of the hostile guards is a thrilling yarn that mounts in suspense and action to a breath-taking climax!

WERTENBAKER, CHARLES. *The Death of Kings*. New York 22: Random House. 1954. 487 pp. $3.95. This is the story of the men who shape events from behind the scenes; who make or break public figures and private reputations; the men who control that latest deadliest engine of power, the news magazine. When Louis Baron got control of the *Beacon*, he wanted to do "a big thing and a good thing." But gradually the pursuit of an ideal turned into the pursuit of power. This is the story of how he achieved it and what he did with it, aided by a brilliant group of editors whom he incited to conflict over policies and power, and whose free-ranging desires led to even more bitter conflicts over women.

WEST, JESSAMYN. *Cress Delahanty*. New York 17: Harcourt, Brace and Co. 1953. 311 pp. $3.75. Mrs. Delahanty was somewhat amazed to see the way in which teen-age Cress "recapitulated" her husband John. There was the matter of lists, to begin with. Fifteen years before, John Delahanty had made a list headed "Reasons for Loving Gertrude Amboy" (now Mrs. Delahanty), over which she had broken their engagement for two days. And now here was their daughter Cress making a list of "Useful Traits for School" which began: "I. Personality. A. Unusual, 1. Witty." The dismaying thing was that Cress really set out to acquire these traits. Growing up on a California ranch involved real effort on her part, and readers will watch her progress, as her parents did, with amusement mingled with heartache for their own growing pains.

Boys were only a part of Cress's education, although it looked as if Edwin would be permanent, and Mr. Cornelius, though far from a boy, was important too. Her "personality" with other girls—from the older Honor Gallagher to her contemporaries Bernardine and Jo—was transformed, too, as she went along.

WHEELER-BENNETT, J. W. *The Nemesis of Power*. New York 17: St. Martin's Press, 103 Park Ave. 1954. 845 pp. $12. The 1952 decision to admit the Federal Republic of Germany to the Western Alliance on an equal basis marks a complete reversal of the policy toward Germany since the close of World War II. It restores Germany, within limits, the right to possess armaments. In this book the author makes it clear that, in his view, this decision was both inevitable and wise. "But," he adds, "we should be doing less than our duty—and even a positive disservice to posterity—if, in our anxiety to secure the future, we were to forget or ignore the lessons of the past." The historian now tells the story of how the German Army, having survived the disaster of 1918, proceeded to dominate the political life of the German Republic, exercising a virtually paramount degree of power and influence by its very withdrawal from the political arena. When the Army later was mistaken enough to play politics instead of controlling them, it began a descent which ended in abject defeat—militarily, politically, and spiritually. The author shows the extent of the Army's responsibility for bringing the Nazi regime to power, for tolerating the infamies once it had attained power, and for not taking the measures—when only the Army could have taken them—to remove the regime from power. The book is a major contribution to the history of our time, fully documented from many new sources. It is written with the authority of an acknowledged expert in the field of German history, and in that style, vivid and graphic, which helped to make his earlier historical books so conspicuously successful.

WHITE, DALE. *The Johnny Cake Mine*. New York 17: Viking Press. 1954. 222 pp. $2.75. Silver—a whole mountain of it! Following the trail of some runaway horses, Jim Norton had stumbled on a fortune. Or so he and seventeen-year-old Earl thought at first. But they soon learned the truth of Uncle Henry's words: "Silver is work—a long way and a million blisters." And they soon learned to work sensibly, for overwork could break a miner's strength, and carelessness could cause a mine cave-in.

WHITE, ROBB. *Midshipman Lee of the Naval Academy*. New York 22: Random House. 1954. 216 pp. $2.75. "Now plebes will be plebes!" yell the Mates of the Deck. This is the call that ends Plebe Summer at the United States Naval Academy and announces that the upperclassmen have returned to take over. When they hear it, all the plebes know that for the next nine months things are going to be *tough*. And they're right. Outside of their rooms plebes can't talk, laugh, or even smile; at meals they can sit on only two inches of the chair seat; they can't walk in the corridors, they have to run; and they don't rate a date. But plebe Courtney Lee has more to worry about than the ruggedness of life at the Academy. He is haunted by the conviction that he's a coward and therefore not fit to be a midshipman at all. It is a nightmare that started many years before, when he was nine—a dream of flame and airplanes and a terrible loneliness which has tortured him ever since.

WILLIAMS, ERIC. *The Book of Famous Escapes*. New York 3: W. W. Norton and Co. 1954. 453 pp. $4.95. The author is an unusual expert. His studies in his own unrivaled library of escape literature have made him the world authority in the field; and he personally carried out the most ingenious and one of the most daring escapes of World War II—a story told in his book, *The Wooden Horse*. From his studies and from his own experience he has selected eighteen first-hand accounts of flight from captivity, ranging from Elizabethan times to the present. With his introduction and com-

mentaries he has woven a tapestry rich in the humor and fortitude of great adventure, and peopled with heroes—men who pitted themselves against fantastic odds. Through every story in this book runs the thread of imperishable humor and humanity which has won for so many escape stories a vast and enthusiastic public. Diverse though the backgrounds are, there is for each escaper the moment of truth—the moment when he says to himself, "This is me, this it!"; when "he knows that he is alone, and that his self-respect and his life depend on the coolness and skill that he can command in the next few seconds."

WOODWARD, DAVID. *The Tirpitz and the Battle for the North Atlantic.* New York 3: W. W. Norton and Co. 1953. 235 pp. $3.50. Centering on the dramatic story of the great German battleship, *Tirpitz,* whose very existence tied up an entire Allied fleet and occupied an air force, the author tells the tale of the last days of the German surface navy. It is a graphic account of the desperate struggle by Hitler's fleet to choke off the huge convoys headed for Russia. It was a wild series of actions in which Allied merchant ships were sent to the bottom by the score, in which aircraft attacked dreadnoughts and minesweepers attacked cruisers. It began with the rebuilding of the German fleet in peacetime by falsifying displacment figures and breaking treaties. It moved into action highlighted by the pursuit and death of the *Bismark.* It ended with the *Tirpitz.* And in between it included the last great surface engagement fought in the western world—probably for all time. This was the glorious and terrible battle between a British battleship and the *Scharnhorst.* It was fought far north of the Arctic circle on the day after Christmas, through high seas and the long night. It ended finally when the *Scharnhorst,* outnumbered at last and blinded, glowing red with her own fires, went under, leaving a handful of survivors afloat in the freezing sea.

Pamphlets for Pupil-Teacher Use

Annual Report of the U. S. Office of Education, 1952. Washington 25, D. C.: Supt. of Documents. 1953. 31 pp. 15 cents. This report, a part of the inclusive Annual Report of the Federal Security Agency, gives a brief survey of the functions and operations of the U. S. Office of Education for the fiscal year 1952. In addition to discussing the history of Federal support to education, the report endeavors to present a clear picture of the role of the office in the nation's total education program and its interest in the safeguarding of local control in Federally supported school programs.

ARNY, C. B., and BLACKWELL, SARA. *Scales for Appraising High-School Homemaking Programs.* Minneapolis 14: Univ. of Minnesota Press. 1953. Specimen set, 75c; 10 copies each of Scales I, II, and III plus *Manual,* $2.50; 10 copies of Scales I and II plus *Manual,* $1.50; 10 copies of Scales I and II, $1.25; 10 copies of Scale III plus *Manual,* $1.50; and 10 copies of Scale III, $1.25. The *Scales* provide a method of comparing a homemaking program with evaluative criteria developed by a large group of home economists and validated against pupil achievement. The *Manual* accompanying the *Scales* describes the procedures used in their development, cites evidence of their qualities as valuation instruments, and offers suggestions for using them.

Australia in Facts and Figures. New York: Australian News and Information Bureau. 1953. 68 pp. An official account of Australian policy, economy, and administration.

BETTS, E. A. *Corrective Reading: Grouping.* Philadelphia 22: The Reading Clinic, Dept. of Psychology, Temple Univ. 1953. 12 pp. 40 cents. A reprint from *Educational Administration and Supervision,* October, 1953. Contains many suggestions as to ways to improve the reading ability of pupils.

Reading Abilities: Averages and Deviations. Philadelphia 22: The Reading Clinic, Dept. of Psychology, Temple Univ. 1954. 10 cents. Discusses sex differences, range of reading abilities, individual needs, and panaceas.

BLACK, A. D. *If I Marry Outside My Religion.* New York 16: Public Affairs Committee, 22 E. 38th St. 1954. 25 cents. Differences in religious affiliation present serious but by no means impossible barriers to a successful marriage. Such is the conclusion of the author.

BLEY, GLORIA. *Let's Talk About Tomorrow.* New York 16: National Child Labor Committee, 419 Fourth Ave. 1954. 16 pp. 10 cents. Of the million young workers who enter the labor market each year, relatively few are familiar with the ways of getting and holding a job. Youngsters should be encouraged to think about preparation for jobs while still in school to avoid much of the present job-hunting confusion, wasted time, and wasted motion. Mindful that few schools have enough guidance specialists to reach all the youngsters in need of counseling, the National Child Labor Committee has issued this vocational guide. It is designed primarily for classroom use, and is equally interesting and helpful to parents.

BOESHORE, E. A. *English and the Secondary-School Program.* New York 27: Metropolitan School Study Council, 525 W. 120th St. 1954. 16 pp. 15 cents. Discusses what is being done in the way of teaching English in the secondary school. Lists some of the continuing problems and also lists 26 trends.

BROWN, J. J., editor. *University and World Understanding.* Washington 6, D. C.: American Council on Education. 1954. 110 pp. $1. A report of a conference of Fulbright scholars on education.

BROWN, K. E., and JOHNSON, P. G. *Education for the Talented in Mathematics and Sciences.* Washington 25, D. C.: Supt. of Documents. 1952. 40 pp. 15 cents. A resumé of the special papers and contributions from seven discussion groups on this subject.

BROWN, K. E. *Mathematics in Public High Schools.* Washington 25, D. C.: Supt. of Documents. 1953. 56 pp. 20 cents. A survey of the extent and nature mathematics education in the public high school may serve; gives enrollment statistics and administrative provisions for instruction in mathematics.

A Career in Community Work. Boston 15: Simmons College, 300 The Fenway. 1954. 4 pp. Guidance information.

CARPENTER, H. M., editor. *Skills in Social Studies.* Washington 6, D. C.: National Council for the Social Studies, 1201 16th St., N. W. 1954. 288 pp. $3 paperbound; $3.50 clothbound. This volume fills an important need in the literature of the social studies. One of the most valuable contributions the teacher can make to the education of youth is the development of a wide range of skills that will be invaluable to them as they enter into adult citizenship. The full development of such skills as are discussed in this yearbook is most essential for the continuance and further development of our demoncratic society. Therefore, it is the responsibility of every social studies teacher and school administrator to do everything possible to incorporate the development of these skills into their teaching and school programs. This yearbook has been prepared with the earnest hope that it will assist all who are interested in the education of our youth and who have a responsibility for the building of a vital educational program that will provide real opportunities for the development of the skills discussed in this volume.

While this yearbook cannot lay claim to furnishing all the answers to the many complicated questions involved in the development of social studies skills, it does furnish many cues and guidelines for the teacher and gives many practical suggestions for the classroom. It is hoped that this publication will stimulate further thinking and experimentation on this important topic. An unusually able group of contributors have moved us ahead in our thinking in this field and bring the reader up to date on related current literature. The volume is composed of thirteen chapters under the following titles: Skills Needed for Democratic Citizenship, Skill Development in Reference to Human Development, The Nature of Critical Thinking and Its Use in Problem Solving, Locating and Gathering Information, Organizing and Evaluating Information, Reading and Listening Skills, Speaking and Writing Skills, Interpreting Maps and Globes, Interpreting Material Presented in Graphic Form, Developing a Sense of Time and Chronology, Participating in Group Undertakings, The Evaluation of Skills, and Developing a Program for the Effective Learning of Skills.

The Codification of School Laws. Washington 6, D. C.: Research Division, National Education Assn. 1954 (Feb.). 48 pp. 50 cents. A survey of how school laws are codified.

College Admission with Advanced Standing. Philadelphia: William H. Cornog, President, Central High School. 1954. 91 pp. Describes this study that is being conducted by the School and College Study of Admission with the Advanced Study Central Committee, of which Dr. Cornog is Executive Director—what the twelve colleges in this study have done and are doing to date.

COMMITTEE FOR ECONOMIC DEVELOPMENT. *Taxes, National Security, and Economic Growth.* New York 22: The Committee, 444 Madison Ave. 1954. 48 pp. Single copies free. This new study on the ever-important subject of taxes considers taxes and possible tax revision in relation to national security and economic growth. It sets forth a number of recommendations affecting not only 1954 but the next few years as well. This statement was under consideration for more than a year by this non-profit, non-political organization of businessmen and educators devoted to economic research and education.

DAVIES, D. R., co-ordinator. *The Third Annual Report of the Co-operative Program in Education Administration.* New York 27: Co-operative Program in Educational Administration, 525 W. 120th St. 1953. 84 pp. A progress report of the co-operative program's work in the three years of its operation, including the accomplishments of each of the five teams.

Driver Education for Adults. New York: Center for Safety Education, Division of General Education, New York Univ. 1954. 16 pp. Provides a bird's-eye view of specific programs, a list of publications on driver education, and an indication of some of the many agencies interested in adult driver education.

Education for Freedom. Washington 25, D. C.: Supt. of Documents. 1948. 20 cents. Explains why public school instruction in American history, the Constitution, civics, and related subjects should be, and are in all states, required by law.

Educational Testing Service. Princeton, New Jersey: The Service, 20 Nassau St. 1954. 127 pp. The fifth annual report of the president covering the year 1952-53.

EISENHOWER, D. D. *Foreign Affairs.* Washington 25, D. C.: U. S. Dept. of State. 1954. 9 pp. Free. Excerpts from President Eisenhower's State of the Union message given on January 7, 1954.

Fall Enrollment in Higher Educational Institutions, 1953. Washington 25, D. C.: Supt. of Documents. 1954. 40 pp. 30 cents. The U. S. Office of Education's 9th consecutive annual report on college enrollments.

FARR, MAUDE, and STORY, R. C. *Statistics of Land-Grant Colleges and Universities, Year Ended June 30, 1952.* Washington 25, D. C.: Supt. of Documents. 1953. 53 pp. 20 cents. This publication continues the series of annual land-grant college reports which had their beginning with the establishment of the U. S. Office of Education in 1867. The land-grant institutions in the United States number only 69, out of a total of about 1,900 higher institutions. This small number of institutions, however, included in the 1951-52 school year 17.2 per cent of the total college enrollment and 34.9 per cent of the total enrollment in publicly controlled institutions. The land-grant colleges conferred 21.4 per cent of all earned degrees. Thus, the land-grant institutions constitute a significant segment of all higher education in the nation.

FEINGOLD, S. N. *How To Choose That Career: Civilian and Military.* Cambridge 38, Mass.: Bellman Pub. Co., P. O. Box 172. 1954. 52 pp. $1. A concise manual on a subject that is all important, easy-to-read, full of timely and helpful information, pretested with parents, counselors, and students, and illustrated.

FILHO, M. B. L.; CREEDY, L. A.; PIRES, E. A.; and CASTILLO, ISIDRO. *The Training of Rural School Teachers.* Washington 25, D. C.: UNESCO Relations Staff, Dept. of State. 1954. 168 pp. Contains four national studies on rural teacher training. Descriptive and interpretive.

FRANZEN, C. G.; JUNG, CHRISTIAN; and HUGHES, OTTO. *Use of Evaluative Criteria in the Indiana Secondary Schools.* Bloomington: Indiana Univ. Bookstore. 1954. 83 pp. $1. Chapter I gives a history of the evaluation program in Indiana; Chapter II explains what the school itself does in the way of self-evaluation; Chapter III recounts the activities of the visiting committee members; and Chapter IV tells how the final report is prepared and submitted.

A Guide to the Engineering Professions in the Aviation Industries. New York 21: Institute of the Aeronautical Sciences, 2 E. 64th St. 1954. 64 pp. Contains basic information relating to aeronautical engineering and its allied professions—demands, training, experience, salary, *etc.*

HACH, C. W., chairman. *A Course of Study in High-School Journalism.* Minneapolis: National Assn. of Journalism Directors, 18 Journalism Bldg., Univ. of Minnesota. 1953. 67 pp. This course of study may be used in schools offering one semester, two semesters, or even two years of journalism. It is organized into eleven units with the idea that it can be adapted to almost any school situation. Each unit contains objectives, activities, bibliography, and other content material. Following are the seven over-all objectives for the course: (1) To develop the ability to read the newspaper intelligently; (2) To develop the ability to listen to the news discriminately; (3) To develop skill in the accurate, concise, creative, and forceful expression of ideas; (4) To train students to work effectively and harmoniously on school publications; (5) To foster habits of dependability, co-operation, and initiative; (6) To promote an understanding of the role of the press and radio in a democracy; and (7) To provide an understanding of the technical processes necessary to produce a school and a daily newspaper. The titles of the eleven units are in numerical order: I. Understanding the Functions, Organization, and Production of a Professional Daily and a School Newspaper; II. Understanding News Values; III. Understanding News Sources and Methods of Obtaining News from Them; IV. Writing the Lead; V. Writing the News Story;

VI. Writing the Interview, Speech, and Varied Meeting Story; VII. Writing the Feature Story; VIII. Writing the Editorial; IX. Learning to Copyread; X. Writing Headlines; and XI. Reading and Listening to the News Intelligently.

A Handbook for University School Parents: A Parent-Faculty Interpretation of the Purposes and Practices of the School. Columbus 10, Ohio: College of Educ., The Ohio State Univ. 1954. 105 pp. $1. While the booklet focuses on the program of a particular school, it demonstrates what can be done by any school to interpret its program and parent organization to parents and the public at large. Parents, school administrators, and many others should find the document suggestive and helpful in their work on improving home-school co-operation, school public relations, and parent organizations.

Highlights of American Railroad History. Washington 6, D. C.: Assn. of American Railroads, Public Relations Dept., Transportation Bldg. 1954. 28 pp. Free. From hundreds of exciting events and interesting sidelights in American railroad history, 72 outstanding incidents have been selected and included in a pictorial treatment in the series of illustrations reproduced in this booklet. Other booklets available free from the same source are: *A Chronology of American Railroads* (12 pp., also includes mileage by states and by years); *The Railroad Story* (32 pp. emphasizes the scientific development of American railroads); and *Rails Across America* (16 pp. presented in comic book form).

HUMPHREY, H. H., JR. *The Stranger at Our Gate.* New York 16: Public Affairs Committee, 22 E. 38th St. 1954. 32 pp. 25 cents. The author points out the need for a basic rethinking of our present inflexible and restrictive immigration practices into accord with our democratic aspirations. He lists and discusses five "persistent myths" that have become widely accepted as facts, which accounts for some of our undemocratic immigration policies.

Invitation to Youth. New York 22: Institute of Life Insurance, 488 Madison Ave. 1954. 32 pp. 15 cents. Colorfully illustrated, this pamphlet points the way toward rewarding careers with the nations almost 800 life insurance companies, whether as a clerk or a typist starting in a home office; an agent selling and servicing life insurance, a mathematician (actuary), or a professional in law, nursing, or medicine.

JOHNS, EUNICE, editor. *Social Studies in the Senior High School.* Washington 6, D. C.: National Council for the Social Studies, 1201 16th St., N. W. 1953. 116 pp. $2. Suggested programs for grades ten, eleven, and twelve. Presents present practices and stimulates thought and discussion as to the direction and form social studies instruction in grades ten, eleven, and twelve should take.

KENT, DRUZILLA; ALEXANDER, MARGARET; and LAXSON, MARY. *Home School, and Community Experiences in the Homemaking Program.* Washington 25, D. C.: Supt. of Documents. Home Economics Education Series No. 29. 1953. 69 pp. 25 cents. Building a close relationship between school experiences and home experiences has been a characteristic part of homemaking instruction ever since Federal funds were first made available for the development of vocational education programs in homemaking. Preparation for home and family living is more and more being considered one of the important goals of education in the modern school. Homemaking education programs in the secondary schools have a unique contribution to make to this preparation, for home economics is the only subject area which is centered on the home activities and relationships which enable the pupil to assume the responsibilities of homemaking. This bulletin was prepared to show teachers some ways that learning experiences carried on at school, in the home, and in the community can be integrated into a total program focused on over-all homemaking education goals.

KVARACEUS, W. C. *KD Proneness Scale and Checklist.* Yonkers, N. Y.: World Book Co. 1954. To help identify those boys and girls who are vulnerable, susceptible, or exposed to the development of delinquent patterns of behavior *before* delinquent patterns have been firmly establised and the children stand before the courts. They are also useful in obtaining clues to the causes of delinquent or pre-delinquent behavior.

LOOMIS, W. P. *Three Dimensional Teaching Aids for Trade and Industrial Instruction.* Washington 25, D. C.: Supt. of Documents. 1953. 91 pp. 45 cents. Illustrates the many ways in which three-dimensional teaching aids may be used in trade and industrial instruction.

MABLEY, JACK. *What Educational TV Offers You.* New York 16: Public Affairs Pamphlets, 22 E. 38th St. 1954. 28 pp. 25c. A picture of what a community has to do not only to provide educational TV but also to carry it on.

MACKINTOSH, H. K., and HILL, WILHELMINA. *How Children Learn To Write.* Washington 25, D. C.: Supt. of Documents. 1953. 24 pp. 15 cents. Shows that the development of written expression is a continuous process which has a simple beginning with young children. During each year of their elementary-school lives, children add new skills and further develop those they already possess. In this bulletin the illustrations stress the close relationship of spelling, handwriting, and the expression of ideas in written form. It discusses six of the most important questions that teachers and parents ask about how children learn to express themselves in writing.

This is another in a series of bulletins on the place of subjects in the elementary-school curriculum. The over-all publication, *The Place of Subjects in the Curriculum,* Bulletin 1949, No. 12, showed how subject matter is introduced into the program in a modern school. As a follow-up, a series of bulletins was planned with six in that series now completed. They are *How Children Use Arithmetic,* Bulletin 1951, No. 7; *How Children Learn About Human Rights,* Bulletin 1951, No. 9; *How Children Learn To Think,* Bulletin 1951, No. 10; *How Children Learn To Read,* Bulletin 1952, No. 7; *How Children and Teacher Work Together,* Bulletin 1952, No. 14; and *How Children Learn To Write.* All bulletins in the series are 15 cents each.

MAGNUSON, H. W., and TASHNOVIAN, P. J. *Salaries of Certificated Employees in California Public Schools, 1953-54.* Sacramento: California State Dept. of Education. 1954 (January). 20 pp. Includes salaries paid full-time teachers, administrators (except superintendents, associates, assistant and deputy superintendents, and business managers) supervisors, and other specially classified personnel serving at all levels of the public school system—kindergarten through grade fourteen.

MILNER, E. J. *You and Your Student Teacher.* New York: Bureau of Publications, Teachers College, Columbia Univ. 1954. 48 pp. 75 cents. What a good teacher who has a student teacher should know in order to do a good job of training the student teacher as well as teaching the pupils in her room.

A New Face For America. Washington 6, D. C.: National Assn. of Home Builders, 1028 Connecticut Ave., N. W. 1953. 28 pp. A program of action planned to stop slums and rebuild our cities. Also available upon this general topic of housing from the same source are the following materials: *American Home Ownership* vs. *Public Housing.* (24 pp., a manual of debate); *Better Homes for Family Living.* (8 pp., a unit on home building for intermediate and upper grades); five large pictorial wall charts; and a 16mm. filmstrip entitled *Your New Home—How To Take Care of It* together with a 16-page discussion manual for the teacher to use following the showing of the film.

Occupational Planning and College. Washington 25, D. C.: Supt. of Documents. 1954. 20 pp. 5 cents. Guidance for men planning to go to college. A similar one, *Your Job Future After College*, is available for women from the same source at 5 cents each.

Open Doors to Children—Extended School Services. Washington 25, D. C.: Supt. of Documents. 1953. 15 cents. The extension of school facilities to provide supervised play programs for children is the subject of this interesting pamphlet. It tries to show in broad perspective how the school can provide a wide variety of play activities meeting the needs of children; can offer opportunities for companionship; can give experiences in group living; and should express concern for the health and nutrition needs of children. In effect, this booklet is a guide for teachers and school administrators in formulating plans for extending school services to meet the play requirements of the community's youngsters.

Planning Schools for Use of Audio-Visual Materials. Washington 6, D. C.: National Education Assn. 1954. 80 pp. $1. It is important that the teacher and the pupils have access to many types of aids to make the classroom an interesting and profitable place for youth. This manual is simple but complete; it is practical yet forward looking. This manual presents in detail the part that good leadership plays in making the center effective in the life of teachers and students. It will help administrators to establish, operate, and make successful an instructional materials center in their schools.

POIROT, P. L. *Public Housing*. Irvington-on-Hudson, N. Y.: Foundation for Economic Education. 1954. 36 pp. Single copy free; 8 copies, $1. Discusses the many factors involved in public housing.

Poliomyelitis. New York 5: National Foundation for Infantile Paralysis, 120 Broadway. 1954. 24 pp. Free. This revised high-school unit has been completely changed to include the latest developments on polio research. Also available is a teacher's guide of 24 pages.

Programs of the Federal Government Affecting Children and Youth. Washington 25, D. C.: Supt. of Documents. 1953. 55 cents. The final report of the Inter-departmental Committee on Children and Youth, this book brings together for ready reference descriptions of the many programs of the Federal government that affect and benefit children and youth. The programs described here are those in operation on June 30, 1950, and cover such important fields as health and medical care, education, social welfare, housing, legal protection, recreation, and others. A section has been included which shows United States participation in international programs for the benefit of the world's younger generations. In addition to describing the individual programs, the programs are also listed, in a separate section, by participating departments and agencies.

Pupil Appraisal Practices in Secondary Schools. Washington 25, D. C.: Supt. of Documents. 1953. 50 cents. How does your secondary school appraise its pupils? Are the grades assigned fair to all? Do they represent values significant in the lives of boys and girls? These and other similar problems were confronted and discussed at the fifth national conference of the Commission on Life Adjustment Education for Youth, held during October, 1952. Transcribed from tape recordings of the principal addresses and panel discussions made during the conference, this report endeavors to point out current developments, problems, and plans for improving pupil appraisal practices in America's high schools, and to promote the more general use of the procedures reported on at the meeting.

REASON, P. L., FOSTER, E. M., and WILL, R. F. *The Common Core of State Educational Information.* Washington 25, D. C.: Supt. of Documents. 1953. 116 pp. 35 cents. Over the years, the language of education has grown, and items of educational information have taken on different meanings in different states. Recognizing the importance of comparability of data and common understanding of basic items, the National Council of Chief State School Officers requested the U. S. Office of Education to conduct a co-operative project with state and territorial departments of education to achieve these objectives. In response, *Handbook I* is the first of four publications planned in the State Educational Records and Reports Series. The handbook is designed to serve the same purpose for certain basic items of educational information as the dictionary serves for words in the English language. Here for the first time is listed the common core of items of educational information that every state department of education should have available annually; the items are defined, and a glossary of individual terms used in the definitions is included. Other handbooks in the State Educational Records and Reports Series will deal with financial accounting, personnel accounting, and property accounting.

REID, SEERLEY, and CARPENTER, ANITA. *A Directory of 2,660 16mm. Film Libraries.* Washington 25, D. C.: Supt. of Documents. 1953. 180 pp. 50 cents. This is a directory of 2,660 film libraries encompassing all kinds of distributors of 16mm. films. With each entry of the name of the library and address is found information as to the approximate number of 16mm. films it has available, their types, and their availability.

Report of the Status Phase of the School Facilities Survey. Washington 25, D. C.: Supt. of Documents. 1953. 140 pp. 70 cents. A summary of the first or status phase of the national School Facilities Survey covering four territories and 39 of the 48 states. According to this status phase of the survey, the demands for additional school building facilities in the United States increase each year, the tide of new pupils swells enrollments to recurring new records, and even accelerated construction fails to keep pace with the need for additional school facilities. Projections based on this report indicate that as of September, 1952, there was a national need for 312,000 public elementary and secondary classrooms to house about 8,900,000 pupils who were either unhoused or were housed in unsatisfactory quarters. Ten billion dollars would have been needed to provide these classrooms and related facilities. The second phase of the survey study, now under way, will indicate the facilities that will be needed for the millions of additional children who will enter the public schools during the next six years. Advance information from some of the states seems to indicate that building need pressures will continue and will increase throughout this decade.

Residence and Migration of College Students—1949-50. Washington 25, D. C.: Supt. of Documents. 1951. 35 cents. This study is the latest in a continuing series concerning the residence and migration of college students in the United States. Compiled from questionnaires received from 1,794 institutions of higher learning, this U. S. Office of Education report includes pertinent statistics covering such features of the study as ratios between college students and the total population, migrations of students from state to state, graduate and undergraduate migration, students from outlying areas of the United States and foreign nations, Negro students enrolled in southern schools, and the drawing power of various types of institutions.

RICHARDSON, C. A.; BRULE, HELENE; and SNYDER H. E. *The Education of Teachers in England, France, and U.S.A.* Washington 25, D. C.: UNESCO Relations Staff, Dept. of State. 1953. 344 pp. $2. A report on three national studies on the

training of teachers as part of the problem of securing sufficient qualified teachers in a program of universal compulsory education.

SELTZER, NORMAN, and CAIN, R. W. *Employment Outlook for Physicists.* Washington 25, D. C.: Supt. of Documents. 1953. 30 pp. 25 cents. A report on employment outlook for physicists giving fields of employments and prospective supply *versus* demand. For use in the vocational counseling of young people in school.

SENESH, LAWRENCE. *International Trade.* New York 22: Joint Council on Economic Education, 444 Madison Ave. 1953. 35 pp. 50 cents. An account of a "pilot project" carried on in a junior high school in New York City in which a teacher and her students worked together to gain a better understanding of the field of international economic relations.

SHOTT, JOHN. *Taft-Hartley Prospect for 1954.* Washington 3, D. C.: Public Affairs Institute, 312 Pennsylvania Ave., S. E. 1954. 48 pp. 40 cents. A collection of information helpful as a guide to the understanding of current discussions on this subject.

The Situation. Washington 16, D. C.: National Science Teachers Assn., 1201 16th St., N. W. 1953. 16 pp. Deals with problems and recommendations related to school participation in incentive programs and guidance services.

State University of New York: Its Progress and Its Prospects. Albany 1: State Univ. of New York. 1953. 148 pp. Proceedings of the third symposium sponsored by State University of New York—a review and a forecast.

STONE, SYLVIA, and ALDRICH, J. C. *A Teachers Guide to World Trade.* New York 22: Joint Council on Economic Education, 444 Madison Ave. 1953. 132 pp. $1. The United States today is involved in the affairs of the world as never before. If the young people of America are to grow up into informed citizens and intelligent voters, aware of the nature of world problems and of this country's stake in them, the study of international affairs must begin in the schools. This is particularly true of world trade, a subject which often baffles both teacher and student. This book has been published by the National Council for the Social Studies in co-operation with the Joint Council on Economic Education. It is divided into two parts: analysis and teaching aids. Miss Sylvia Stone writes the analysis of the problem and J. C. Aldrich, Alice Brandt, J. B. Clemm, E. J. Gaines, and Lawrence Senesh supply teaching aids.

STONG, B. J., and OLDS, LELAND. *A Look into Hells Canyon.* Washington, D. C.: Public Affairs Institute, 312 Pennsylvania Ave., S. E. 1954. 32 pp. 15 cents. Discusses some of the issues involved concerning the development of this waterpower site in the Columbia River basin.

Summaries of Studies in Agricultural Education—Supplement No. 7. Washington 25, D. C.: Supt. of Documents. 1954. 75 pp. 30 cents. Includes summaries for 156 studies, 24 of which represent non-thesis studies conducted by professional workers on the supervisory or teacher-training staffs in the several states; fourteen are summaries of doctoral dissertations; forty-one are research problems, other than theses, completed in partial fulfillment of the requirements for master's degrees; and the remaining 77 are summaries of theses written as part of the work for M. S., M. Ed., or M. A. degrees.

TEAGLE, RAPHIEL; MARIONNEAUX, P. E.; LANDRY, T. R.; and COLLETTE, MABEL. *Handbook for School Administrators.* (Bulletin No. 741). Baton Rouge:

Louisiana State Dept. of Education. 1954. 296 pp. This is for use of elementary- and secondary-school administration in Louisiana. It contains essential information which must be considered by school administrators in organizing and administering elementary and secondary schools acc rding to approved standards established by the State Board of Education. It emphasizes principles of democratic leadership.

This We Believe About Education. New York 20: National Assn. of Manufacturers, Public Information Division, 14 W. 49th St. 1954. 32 pp. Free. The report of a study covering such vigorously debated subjects as the basic purposes of education, the rights of teachers, objective teaching *vs.* indoctrination, academic freedom, and the investigation of charges against schools and educators. Conclusions are reported in eleven broad areas of agreement. This is a guide to both individuals and organizations in resolving conflicts and misunderstandings.

TWITTY, TOM, and WADE, MASON. *Canada—A Great Small Power.* New York 17: Foreign Policy Assn., 345 E. 46th St. 1954. 64 pp. 35 cents. The economic boom that has more than doubled Canada's gross national product since 1945 and her growing influence in world affairs are discussed. Discussion guide, maps, charts.

VAN VOLKENBURG, J. L. *Television as an Extension School of Democracy.* New York 22: CBS Television, 485 Madison Ave. 1953. 20 pp. A commencement address at the University of Minnesota by the President of CBS Television Co.

Warren Yearbook Suggestions, 1953-54. Boston: S. D. Warren Co. This is a packet of materials on the productions of the yearbook. It contains a 90-page (8½" x 11") book entitled *Better Yearbooks Through Better Planning* and other booklets which present specimen pages of college and high-school yearbooks printed by letterpress and by offset. Another booklet, *Warren's Yearbook Progress Chart* (12 pages), provides ruled space to enter all information on the yearbook as it develops from day to day. It is arranged in columns under the following column headings: Page Number, Page Descriptions, Copy Assigned to, Copy Due, Copy Sent to Printer, Drawing and Photo Assigned to, Drawing or Photo Due, Drawing or Photo Sent to Engraver, and Page Completed. In these various source materials will be found information on: layout, type, screening of pictures, quality of paper, planning and directing the progress of the yearbook, methods of financing, selling advertisements, and many other ideas that will be helpful to those assigned the responsibility of producing an attractive and financially successful yearbook.

WILKINS, THERESA. *Higher Education, Education Directory, Part 3.* Washington 25, D. C.: Supt. of Documents. 1954. 183 pp. 55 cents. Lists the institutions of higher education alphabetically by state.

WOLFF, GERTRUDE, editor. *Your School Libraries.* New York 36: Library Journal, 62 W. 45 St. 1954. 25 cents each, three for 50 cents. Tells why more and more states and cities are requiring that every school have a central library, and also gives the latest standards and averages for all parts of the country. There are also articles on how to start with as little as $750, what books to consider, and how to buy to best advantage.

WOODBURN, J. H. *Available Materials and Services.* Washington 6, D. C.: National Science Teachers Assn., 1201 16th St., N. W. 1953. 18 pp. 50 cents. Contains information helpful to science teachers and their pupils to discover materials and services that are currently available to them.

Publications Received Just Before Going to Press

Professional Books

BERTALAN, F. J. *Books for Junior Colleges.* Chicago: American Library Assn. 1954. 335 pp. $7.50. This is a list of 4,052 books, periodicals, films, and filmstrips dealing with this area of secondary education. The listings are organized into subject areas. It has been prepared to assist junior college librarians in the selection of these types of materials for developing a comprehensive and serviceable library for both teacher and student. The listings are made under 23 different headings or subject areas—without duplication under related headings.

CASSIDY, ROSALIND. *Curriculum Development in Physical Education.* New York 16: Harper and Bros. 1954. 415 pp. $4.50. This is the first text on the physical education curriculum to be published in many years. The work of a nationally recognized authority in this field, it describes the development of physical education curriculums at the various levels: teacher and class, departmental staff, all-school, citywide, and statewide. The text covers the problems entailed in program planning, objectives to be achieved in physical education, and the processes and principles inherent in building the curriculum at each of the levels listed above. Many examples of current practice are given at each level.

COMMINS, W. D., and FAGIN, BARRY. *Principles of Educational Psychology.* New York 10: Ronald Press Co. 1954. 811 pp. $5.75. Reflecting today's self-searching re-evaluation of the role of the teacher by leading educators, this revised basic textbook underscores the importance of applying sound psychological principles to modern education. It points out the teacher's need for a strong background in psychological theory if he is to understand children completely and help to alleviate their educational problems. It is based on the belief that educational psychology must be taught as a science—an empirically derived discipline with unifying concepts. It presents the most significant theoretical approaches in addition to those current techniques that have the most important implications for the guidance of learning. Treatment of the principles of maturation, learning, personality and adjustment, measurement, individual differences, and guidance focuses on what the authors believe to be the core of professional teacher training—human development. While maintaining, as in the previous edition, that the common ground of psychology and education lies in the field of mental growth, the authors have extensively rewritten this edition to reflect the new studies in social backgrounds of child development, group processes, communication problems in counseling, and learning as a social process.

GOULD, GEORGE, and YOAKAM, G. A. *The Teacher and His Work.* Second edition. New York 10: Ronald Press Co. 1954. 402 pp. $4.50. This new edition continues to exemplify the authors' approach to the purposes and nature of the first course in education. It should assist the student in developing a perspective of the whole field of public education in the United States and help him to acquire some insight into the general nature of the professional activities and responsibilities of the teacher. More specifically, this book discusses the personal qualities a good teacher must have, his educational preparation, the economic status a teacher may expect to achieve, and a teacher's relationships with the community and with professional organizations. Attention is given to the major instructional activities of the teacher and to the need for sympathetic understanding of the nature of the child.

The student is made acquainted with the origins and spectacular growth of our educational system, the conditions and influences that have shaped its purposes, the manifold contributions of educational leaders to its development, the purposes and functions of the various school units, and the methods of financing public education. The final chapter introduces the student to some of the more important problems involved in evaluating learning.

GRIEDER, GALVIN, and ROSENSTENGEL, W. E. *Public School Administration.* New York 10: Ronald Press Co. 1954. 634 pp. $6. This textbook gives students a grasp of the nature and problems of efficient public school administration. Designed for the introductory college course, it consistently emphasizes the modern concept of educational leadership in democratic society. Written out of the authors' wide experience in rural, town, and city school systems, the book is a guide for school superintendents and administrators. They will find in it timely information and expert advice applicable to scores of everyday situations. To assure ready assimilation by the beginning pupil, the book first introduces him to the general aims, functions, and organization of public education. Guiding principles are then translated into practice through detailed descriptions of preferred administrative procedures and specific techniques. From improving the instructional program and administering pupil services to operating the plant, improving teacher welfare, and meeting today's acute financial problems, the book gives an account of the carefully-worked-out methods which are essential in forward-looking public school administration. While organized for maximum effectiveness in the "fundamentals" course, the book can readily be extended, with supplementation, to serve as a text in more advanced courses. Topics for study and discussion are included with each chapter to provide further application of principles.

GRUHN, W. T. *Student Teaching in the Secondary School.* New York 10: Ronald Press Co. 1954. 312 pp. $4.25. This book is designed to provide the student teacher with a better understanding of his responsibilities. It is directed at the specific problems faced by the teacher-in-training from the time he begins his practice-teaching until he is ready to seek a position. It will be helpful in courses that lead directly to student teaching; as an aid to students observing in secondary schools; as a basis for conferences before and during the student-teaching period; and as a reference guide for all student-teaching activities. It helps the student to understand his professional relationship with the principal, other teachers, pupils, and parents. It assists the student in planning his work for the classroom, in participating in guidance and extraclass activities, and in working effectively in the school and the community. Emphasizing modern practice rather than theory, the author suggests a sufficient variety of activities to suit many different teaching situations in laboratory schools and co-operating public and private secondary schools. Much attention is given to student teaching in the core-type class, using the experience centered approach, group activities, and other new methods. Student teachers are urged to use these methods wherever possible, but to adapt themselves to the school situation in which they are placed and recognize the preferences of the principal and teachers in the co-operating school.

HARRAL, STEWART. *Keys to Successful Interviewing.* Norman: Univ. of Oklahoma Press. 1954. 237 pp. $3.75. The gathering and transmission of news from all over the world—by means of radio, television, newsreels, magazines, and newspapers—are modern miracles. But one fact remains unchanged: all interviews (those who get the news) must still ask the right questions to get the right answers. This book is a collection of tested techniques and strategies used successfully by many of the country's

best-known writers, reporters, and newsmen. This guidebook and manual will prove valuable to public relations counselors, newscasters, foreign correspondents, information specialists, novelists, short story writers, and many others who find it necessary to ask questions and get answers.

HUSSEY, D. P., editor. *Children in Focus: Their Health and Activity*. Washington 6, D. C.: American Assn. for Health, Physical Education, and Recreation, 1201 16th St., N. W. 1954. 287 pp. $3.50. The intent of this book is to assist all of those who have anything to do with the planning or executing of a program of health, physical education, or recreation for children of the elementary-school age group. It should be of invaluable help to those in teacher education institutions who have charge of elementary education, to classroom teachers, to health and physical education teachers, and to leaders in recreation. The Yearbook Committee of the American Association for Health, Physical Education, and Recreation selected the elementary area because of the many requests for a comprehensive book in this field. Twenty-four outstanding authorities have contributed chapters to this book. No attempt was made by the editing committee to adjust the styles of the individual authors to one pattern. The committee, however, did take the liberty of illustrating certain portions which are indicated by the italicized insertions.

OBERTEUFFER, DELBERT. *School Health Education*. Revised edition. New York 16: Harper and Bros. 1954. 464 pp. $4.50. This is a thorough revision of a volume which has become widely known in its field. All of the material has been brought up to date, including the extensive reading lists, and many of the chapters have been almost completely rewritten. The author's purpose, however, has not been altered: to give a comprehensive picture of the many aspects of the school health program, and to describe current policies and procedures in this field. The discussion covers attainable goals of school health education, existing patterns of health instruction, and modern health activities and services.

REMMLEIN, M. K. *The Law of Local Public School Administration*. New York 36: McGraw-Hill Book Co. 1953. 283 pp. $4.50. This text, by the author of *School Law*, advances further into the field of education with a primary direction toward the administrator or prospective administrator, although it may also be of interest to the teacher. Consisting essentially of descriptions and explanations, this book includes an entire range of topics pertinent to administrative functions: powers, duties, and liabilities of school boards, school finance, district organization, building construction, pupil transportation, among others. These subjects are discussed in terms of statutory provisions and their judicial interpretation, with sufficient reference to legal citations. National in scope, this book provides the means for the evaluation of the law current in any particular state. Using a new approach of the legal point of view, the volume is devoted to legal principles, provisions, and their interpretation. No single book covers all the topics included in this comprehensive text. Recent legislation and court decisions are discussed, and *future* legislation is suggested and indicated by the inclusion of nationally adopted principles and model legislation.

ROMINE, S. A. *Building the High School Curriculum*. New York 10: Ronald Press Co. 1954. 532 pp. $5.50. This work provides a comprehensive survey of the secondary-school curriculum and the influences that shape it. It describes and analyzes the fundamental bases upon which a firm understanding of the curriculum must depend—the nature of democratic society, the nature of the learner, and the nature of the educative process. A complete review of the historical development of the curriculum is followed by an application to curricular problems of the principles of educational

sociology and adolescent psychology. Concrete plans, illustrated with numerous examples, are set forth for accomplishing the various phases of curriculum building. Rather than attempting to give pat answers for all possible situations, the book provides working principles and guide lines for the solution of specific problems. The close connection of the curriculum to other aspects of the educational process is discussed, highlighting such questions as teaching methods, the proper selection and use of textbooks, employment of audio-visual aids, the place of guidance services, and the integration of pupil activities and work experience. The book explores numerous problems arising in the fields of administration and school-community relations. It includes a large number of references to contemporary research.

SHAFER, P. W., and SNOW, J. H. *The Turning of the Tides*. New York 17: The Long House, P. O. Box 1103, Grand Central Annex. 1953. 192 pp. Library edition, $3; paper, $2. The authors present selections from educational writings, statements, *etc.* with the purpose of describing the basic premises and objectives of what they state is a movement on the part of some to remake America through the schools. One quotation from one of the authors is as follows: "I believe that a movement which arrogates to the educational profession—or to any other profession or segment of our national life—the awful responsibility of 'social reconstruction' is subversive."

SPALDING, W. B. *The Superintendency of Public Schools—An Anxious Profession*. Cambridge: Harvard Univ. Press. 1954. 64 pp. $1.50. This is the Inglis lecture for 1954. It explores some of the causes of the anxiety which the author feels plagues superintendents of schools.

THORPE, L. P., and SCHMULLER, A. M. *Contemporary Theories of Learning*. New York 10: Ronald Press Co. 1954. 488 pp. $5.50. The textbook analyzes the most important contemporary theories of learning in clear and simple language. Designed for college courses in the psychology of learning and advanced educational psychology, it devotes a chapter to each of the main types of theory which have affected modern educational practice. It shows their relevance to the educational process and points out that underlying the many conflicts between these theories is a common ground upon which an intelligible pattern of classroom procedure can be based. Each chapter is divided into four parts: (1) an objective statement of the theory, (2) a presentation of experimental verification, (3) a critique of the theory, and (4) a discussion of its implications for the conduct of education. Written in concrete, readable style, the book indicates the fundamental principles upon which each theory is based and distinguishes them from subsidiary proposals. Principles of learning and other abstract statements are illustrated by actual examples which illuminate the concepts involved. The systems of learning selected are those whose development has been contemporary with the growth of the modern school. Following the discussion of each theory the authors describe its applications to present-day classroom procedure. In the final section of the book they point out the need for a common basis of learning theory, and suggest an eclectic synthesis of the many theories described. This synthesis goes far toward revealing to students of education the insights to be gained from the work of the theoretical psychologist.

YEAGER, W. A. *Administration and the Teacher*. New York 16: Harper and Bros. 1954. 597 pp. $4.50. In this volume, the author discusses one of the most difficult—phases of educational leadership: the administration of staff personnel. (The other aspect of the personnel function in educational administration was discussed in his earlier volume, *Administration and the Pupil*—a work which gained wide pro-

fessional attention.) This book sets forth clearly the several divisions of the functions of administering staff personnel. The major problems involved are discussed at length —such as teachers' preservice education, selection, orientation, in-service improvement, health, economic position, tenure, promotion, academic freedom, community relationships, pensions and retirement, and many others. A theme running through the text is that teaching is one of the great professions, and a major purpose of educational administration is to maintain a high level of educational endeavor, capable of meeting the educational challenges of our society. The book is readable, well arranged, and provided with an abundance of illuminating illustrative material and study helps. The books, composed of 25 chapters, is divided into the following seven parts: Teaching as a Profession; Providing for Teachers; Selection, Appointment, and Adjustment of Teachers; In-Service Improvement of Teachers; Teacher Welfare; Administrative and Professional Problems; and Educational Leadership and Organization for Personnel Administration.

Books for Pupil-Teacher Use

BAUMAN, ELIZABETH. *Coals of Fire.* Scottdale, Pa.: Mennonite Pub. House, 610 Walnut Ave. 1954. 136 pp. $1.95. This is a collection of twenty stories each of which reveals a practical application of the non-resistance principle in an actual situation. The stories are based on historical fact. They reach as far back as Isaac of the Old Testament and into the present to include a Mennonite Central Committee relief worker, Marie Fast. They have been culled from various periods of history—the early Christian era, the Reformation, Colonal days, both World Wars, and even more recent times. They show how the way Christian love can bind people together. Some also show how that way may bring suffering and even death. All of them demonstrate how the way of love calls for the highest type of heroism.

BEALE, H. K., editor. *Charles A. Beard.* Lexington: Univ. of Kentucky Press. 1954. 325 pp. $4.50. "Charles A. Beard," writes the author in this book, "became one of the two or three great figures of American historiography of the first half of the twentieth century because of a peculiar combination of qualities. He stimulated his fellow historians through his constant probings for the meaning of history; yet he could at the same time present history in terms comprehensible and stimulating to the layman. He was living proof that scholarship and popular appeal were not mutually exclusive, but at their best were inseparable. He smashed the barriers that departmentalized the social studies by making himself an expert in several departments and then refusing to be confined within any one discipline. He delved into philosophy and gave the profession 'relativism' to argue about. He deplored using history to support current opinions but pleaded for the use of history to find answers out of human experience for baffling modern problems. He symbolized as did no other man of his generation the scholar applying what he had learned from the past to the problems of the present and descending into the thick of combat unafraid, determined, braving the wrath of the mighty, using his powerful pen and the evidence of history to battle for basic American freedoms wherever he felt they were endangered.

"Participation in this volume by no means implies agreement with all of Beard's opinions or the absence of emphatic criticism of some of them. Uncritical eulogy would not have been a tribute worthy of Beard. Beard himself would not have wanted it. The contributors to this volume are rather people of various 'frames of reference' who would differ with each other and with Charles Beard on many scholarly and public questions. Some of them are highly critical of his foreign policy views. Others

have differed with him on other matters. None of them has agreed with him at every point.

"What has bound the contributors to this volume together has been a respect for Charles Beard the scholar, a sense of obligation to Beard the provoker of thought, an admiration for Beard the devoted public man, in some instances a sense of having been profoundly influenced by Beard or his writings, and in the case of all of us who knew him personally an abiding affection for a great human being."

BEARD, S. G., and ROBINS, HANNAH. *American History Funbook*. New York 16: Hart Pub. Co., 114 E. 32nd St. 1953. 160 pp. (8" x 10¾") $1. This is one of the publisher's new series of books entitled *Educational Books*. This book in color is addressed to youth between the ages of 10 and 15. Its pages present a potpourri of quizzes, stories, crossword puzzles, things to make and do, humor, facts and information, poetry and song, and word games based on incidents and events from American history.

———— *Geography Fundbook*. New York 16: Hart Pub. Co., 114 E. 32nd St. 1953. 160 pp. (8" x 10¾") $1. This is another of the publisher's *Educational Books* series. It is addressed to pupils between the ages of 9 and 14. It is packed with picture puzzles, stories of explorers, fascinating facts, drawing and coloring fun, humor, cartooning lessons, and word games, all based on geography. It is printed in color.

BEIM, JERROLD. *Rocky's Road*. New York 17: Harcourt, Brace and Co. 1954. 150 pp. $2.75. Basketball or the newspaper—which should it be?—for Rocky finally realized there wasn't time for both. When the class bully, dropped from the team for poor scholarship, decided to upset Walt's plans for the next issues of the paper, Rocky made his choice in a hurry.

BENARY-ISBERT, MARGOT. *The Shooting Star*. New York 17: Harcourt, Brace and Co. 1954. 128 pp. $2.25. A mountain vacation was what Annegret and her mother needed to recover completely from pneumonia—that is what the doctor ordered and that is what Father planned. Mother made all kinds of objections to leaving Germany and going off to Switzerland for three months without Father. Annegret, too, was listless about the idea, but the day came when they departed by train for Arosa, a small resort high in the Alps. Even when Annegret found they were to stay in a delightful house called The Shooting Star, with a small observatory attached, owned by an astronomer and his wife, she didn't feel excited.

BERTON, PIERRE. *The Royal Family*. New York 22: Alfred A. Knopf. 1954. 288 pp. $3.75. Here is a new Victoria; Albert, who managed to make himself into the very abstraction of a Royal Consort; Edward VII, who learned to take his rebellious pleasures discreetly and who was inordinately fond of playing practical jokes on his helpless cronies; George V, that seafaring man who lived by the clock and bellowed orders through the palace halls as if he were perpetually aboard ship; and Queen Mary, that beloved and extraordinary woman who stopped the clocks of change and never recognized the telephone; Edward VIII, Duke of Windsor, who gave up the throne for the woman he loved; George VI, and his Queen, the first monarchs in the modern style, who patterned themselves to a new, popular, and rather bourgeois image of royalty and liked nothing better than to romp on the floor with their children; and, of course, Elizabeth II and Philip.

BUEHR, WALTER. *Through the Locks*. New York: G. P. Putnam's Sons. 1954. 64 pp. $2.25. No one knows who built the first canal but, from earliest times, canals

have played a vital role in the story of transportation. Here is an account of their history, their operation, and their ever-increasing importance in the modern world.

BUNCE, LOU, adaptor. *Captains Courageous.* Chicago 11: Scott, Foresman and Co. 1953. 263 pp. $2. Here is a group story of 21 chapters, illustrated, for teachers who want to encourage worth-while leisure-time reading—especially by their retarded or classic-shy pupils. The author, a New Jersey English teacher, has done the simplifying, providing help along the way (in the form of footnotes) with difficult concepts and special testimonology. Ninety per cent of the vocabulary is from the first thousand words of Thorndike's *A Teacher's Word Book,* the publishers say.

CARLSON, N. S. *Alphonse, That Beearded One.* New York 17: Harcourt, Brace and Co. 1954. 78 pp. $2.50. Out of French Canada comes this robust and rollicking tall tale of a bear cub who was trained by his master, the shrewd Jeannot Vallar, to march, to shoulder a gun, to handle a sword, and to wear helmet, jacket, and boots like any soldier. When the governor's man, Corporal Pagot and Soldier Genest, came to conscript Vallar to fight against the Iroquois, he sent Alphonse off with them in his place. And then the fun began!

COLBY, C. C., and FOSTER, ALICE. *Economic Geography.* Boston 17: Ginn and Co. 1954. 739 pp. $3.72. The educational objectives which give the study of economic geography a place in the school curriculum are reflected in the plan and organization of this book. The work is divided into seven parts, the first of which is concerned with the world as a whole and the other six with its major regions. Throughout the book the all-important question of livelihood appears again and again, first introduced in terms of occupational groups and subsequently in terms of major industries. As the thought of the book develops, moreover, the natural conditions and resources on which all industry and trade are based are kept constantly in the foreground. To assist the pupils in gaining a working knowledge of the outstanding nations of the world, each major producing and consuming nation is treated separately. In addition, the international significance of these regions is brought out by the ever-recurring theme of trade and commerce, a theme which, like that of livelihood, runs throughout the book.

As the modern world depends upon modern transportation and as transportation problems are characteristic of most part of the commercial world, an analysis of each type of transport—rail, highway, water, and air—is presented in an early chapter. Subsequently, studies of transportation in eastern and western United States and in other areas show the interrelation of the several types of transportation to the major commercial regions.

Every student of world affairs admits the importance of maps, especially political and physical maps. In recognition of this fact and of the further fact that many schools cannnot furnish atlases to their pupils, this book features an Atlas Section containing a specially designed series of colored political and physical maps. To acquire ability to read and use these maps will in itself be a valuable achievement for the pupil.

In its treatment of natural conditions and resources, this book makes a double departure from the past. In the first place, climate, surface features, soils, and other elements of the natural environment are given separate treatment early in the book. In the second place, these basis conditions and resources are treated in a geographic rather than a physiographic manner. By means of maps and texts, for example, the distribution of the plains, hills, plateaus, and mountains of the world is brought out. In similar fashion the distribution of the largest fifteen drainage basins rather than the

work of running water is emphasized, and the mineralized areas of the world, areas of enormous significance in world affairs, are mapped for the first time. It is believed that this new method of approach will be welcomed both by teachers of geography and by those interested in the social studies.

CROCKETT, L. H. *The Magnificent Bastards.* New York 3: Farrar, Strauss and Young. 1954. 304 pp. $3.50. This is a novel of the Marine Corps and of women in a theater of war, written by a woman who was herself a major in the American Red Cross with a record of five years' service in the Pacific. It is the story primarily of four people whose lives become emotionally entangled on New Caledonia and then Guadalcanal. In the twelve months between the departure for the New Georgia campaign by the Marine Raider battalions and the Saipan-Guam assault in June 1944, violent events take place that twist, confuse, tortue, and ennoble the lives of four people.

DARINGER, H. F. *Bigity Anne.* New York 17: Harcourt, Brace and Co. 1954. 177 pp. $2.50. It has been exciting for the four Todd children when their father went off to Ecuador on an engineering job. They wouldn't really be lonely, for Mrs. Malet, the housekeeper, had been almost like a mother to them ever since their own mother had died. But when Mrs. Malet had to leave to take care of a daughter who was seriously ill, everything changed.

DAVIS, I. C.; BURNETT, JOHN; and GROSS, E. W. *Science, A Story of Observation and Experiment.* Book 1. New York 17: Henry Holt and Co. 1954. 351 pp. $3.16. This is the first book of the three in the Holt Science Series. In writing this book and in the overall planning of the series, the authors have recognized the accepted requirements of various state syllabi and school curricula. The general practices of those school systems that begin the formal study of science at the junior high-school level have also been taken into consideration. No background is assumed other than the informal knowledge acquired in the lower-grade science readers. In presenting to the pupil his first real experience in science, the authors have tried to give a clear picture of those scientific concepts appropriate to the pupil's grade level. These concepts are followed in Book 2 by slightly more difficult concepts without duplicating the material in Book 1. In each of the three books of the Holt Science Series, the aim has been to present various scientific concepts and to show how they apply to everyday life. The authors have particularly kept in mind the pupil's common interests, activities, and experiences. In every case, the methods and materials included here have been both useful and successful in the authors' own classrooms.

Each of the ten units in Book 1 intended for seventh-grade pupils develops a single major scientific area. The units follow in logical progression, thus stressing the interrelation of these areas. The units are divided into sections A, B, C, and so on. Each one deal's with a particular area of inquiry and solves a particular problem. These sections are followed by short questions that pertain specifically to the material covered in that section. This arrangement provides the teacher with a natural basis for assignments and lesson planning. Because of their squential order of difficulty, the A, B, C subdivisions of the units also provide a practical plan for adjusting the course to meet individual and group differences. Each unit begins with a preview titled "The Story of Observation and Experiment." The preview introduces the pupil to the topic he is about to study. Here, the historical background of the unit topic is treated. The full-page picture that accompanies each preview may become the subject for a special report. The preview itself should be used as a basis for class discussion.

——————— *Science, A Story of Experiment and Discovery*. Book 2. New York 17: Henry Holt and Co. 1954. 448 pp. $3.28. Book 2, like Book 1, explores the "what," the "how," and the "why" of science, and views science as an important part of the pupil's life, his work, and his play. It is organized to include all the concepts appropriate to the pupil's grade level. The authors have taken into consideration the requirements and recommendations of various state curricula and syllabi. They have also kept in mind the pupil's interests, activities, and experiences. The material included in Book 2 has proved successful in the authors' own classrooms. Each unit develops a single major scientific area. The units follow in logical progression, thus stressing the interrelation of these areas. The major divisions and the organization of additional work and aids of this book follow the plan of Book 1.

DIVINE, DAVID. *The Golden Fool*. New York 11: Macmillan Co. 1954. 247 pp. $3.50. The author has returned to the locale and the characters he portrayed in *Wine of Good Hope*, the ancestral estate of Languedoc where for 250 years the Lemaires had nursed their vineyards and traditions. His story combines a picture of the Transvaal section of Africa with the suspense of a thriller. A version of the book appeared recently in *The Saturday Evening Post* under the title "The Devil's Gold."

DULL, C. E.; BROOKS, W. O.; and METCALFE, H. C. *Modern Chemistry*. New York 17: Henry Holt and Co. 1954. 599 pp. $3.88. This book has been completely rewritten and revised to keep it abreast with the latest developments in chemistry and most widely accepted methods of teaching this science. It contains all the theory that is needed for a secondary-school course, as well as sufficient descriptive material to form a suitable course of instruction for those who do not plan to go to college. The authors have purposely included more material than can be covered well in one school year. This is in accordance with their wish to offer a textbook that will fit the needs of teachers in widely different communities. Accordingly, teachers should feel free to select those chapters which best meet their local needs as well as the individual needs of their pupils.

The authors suggest that the common gases and the more fundamental portions of chemical theory be included in all chemistry courses, together with such additional material as the local conditions and available time permit. The gas laws, the more difficult portions of theory, and extensive drill in chemical equations and problems may well be reserved for college-preparatory students. For pupils who are not planning to go to college, a course richer in descriptive material is possible. The chapters dealing with chemical theory are short in order that the essential ideas may be fixed in the pupil's mind before a new portion of theory is presented.

As a guide in the selection of material, the authors have marked with an asterisk certain whole chapters, paragraphs in other chapters, and certain questions and problems. These starred sections are intended for the better pupils. The needs of the average pupil are provided for in the unstarred material. The book has been written so that, even with the omission of the starred material, a connected understanding of subject matter in logical order may be obtained. For the superior pupil, two groups of questions, entitled "Check Your Progress in Chemistry" and "Challenging Your Knowledge," are offered at the end of each unit. These are purposely designed to challenge even the best pupils. "Check Your Progress in Chemistry" also provides an abundance of drill in chemical equations and all types of problems. Particularly in later chapters on descriptive chemistry, some teachers may prefer to take up certain topics in a different order from that given. Such interchange can be made without loss.

The authors have endeavored to make the book truly modern, both in the chemical theory presented and also in the chapters dealing with descriptive chemistry. They have eliminated discarded theories and outmoded ideas. Obsolete industrial processes have also been omitted. The present-day viewpoints concerning chemical phenomena are presented. An effort has been made to discuss them as accurately as possible. Thus the pupil will not have to unlearn in college what he has learned in high school. Pupils who are not going to college deserve to have the correct facts, just as much as college preparatory pupils do.

DUNCAN, KENNETH. *Golden Amber Shore.* Atlanta, Ga.: Tupper and Love., 1090 Capitol Ave., S. E. 1954. 387 pp. This is the story of the conquest of the Incan Kingdom. Sweeping from Peru to Spain, across France into Germany, and back to Peru, it deals with danger, violence and love, and with the men and women who had a part in this conflict and drama. It tells of the fantastic conquering by a few Spaniards of an empire both advanced and cultured by new world standards. Here is the love affair of Juan de Balboa and Estrella, and Juan's tender love for Moon Blossom. You will long remember the Incan prince, Rumi, a worshipper of the Sun God who learned to hate Spaniards but who unhesitatingly rode between death and Juan; memorable, too, are the tempestuous gypsy Carmen and her tribe; the treacherous Fellipillo; and the hunchback, Porco. The magnificance of the Incan Kingdom; civil war between the half-brothers, Atahuelpa and Huascar; the revolt in Cordoba against the Spanish Inquisition which resulted in the rescue of Estrella from the brasero; the struggle of the rescued and rescuers to reach the free city of Württemberg and, finally, the parting of Juan and Estrella, and his return to Peru are all woven into the tapestry of this historical novel.

EAGER, EDWARD. *Half Magic.* New York 17: Harcourt, Brace and Co. 1954. 217 pp. $2.75. Instead of being the best time of the year, summer vacation seemed quite unsatisfactory to Jane and Mark and Katherine and Martha. All their friends went off to stay at lakes or in the mountains, but because they had no father and their mother worked hard on one of the newspapers, the four children had to stay in town and find what amusement they could. Books from the library helped a lot, particularly the magic books of E. Nesbit, though the four children couldn't help wishing something exciting would happen to *them*, the way it did to the book children. Then one day Jane picked up what she thought was a nickel, and in no time at all strange things began to occur!

EHRENSPERGER, H. A. *Change of Heart.* New York 10: Friendship Press. 1954. 167 pp. $2, cloth; $1.25, paper. This story centers around Nihar, an 18-year-old Christian in India. He goes to Calcutta to work. Here he comes under the spell of Vinoba Bhave, the man who has inherited Gandhi's spiritual mantle.

FARNSWORTH, F. J. *Winged Moccasins.* New York 18: Julian Messner. 1954. 189 pp. $2.75. This is the story of a Shoshone Indian girl whose winged moccasins carried her over the shining mountains, the first woman to cross the Rockies, as interpreter and guide for the Lewis and Clark expedition. Sacajawea was only ten when her father, a Shoshone Chief, was killed by a hostile tribe. She was taken prisoner and sold into slavery. During the next several years she traded from one tribe to another until, while a slave of the Mandans and still not yet twenty, she attracted the attention of Toussaint Charbonneau, a trapper, and became his wife.

GRAHAM, LEE. *If You Are a Woman.* New York 16: Thomas Y. Crowell Co. 1954. 288 pp. $3.50. Thousands of women have written to the author for advice.

This book embodies the help that she has given to these persons during the past three years in letters and on her television program "Letters to Lee Graham." The chapter titles are: Before You Are Married, You as a Wife, You as a Mother, The Middle Years, and the Sunset Years.

HARNETT, CYNTHIA. *The Drawbridge Gate*. New York 16: G. P. Putnam's Sons. 1954. 250 pp. $3. Become a mercer! Young Dickson Sherwood, a grandson of a Master Grocer, couldn't believe his ears. Only that morning he had fought and roundly worsted one of the hated mercers' apprentices—surly, redhaired Kurt Bladebone. Now he was to be one of their company, with special instructions from Master Dick Whittington to watch for signs of the secret activities of Lollard conspirators against King Henry V.

HAYES, JOSEPH. *The Desperate Hours*. New York 22: Random House. 1954. 302 pp. $3.50. The Hilliards' nightmare began in broad daylight, when—by an incredible twist of fate—three escapees from Federal prison at Terre Haute chose a home just outside the city limits of Indianapolis as a temporary hide-out. The innocent courage of the helpless family—husband, wife, daughter, and small son; the arrogance of the trigger-happy crinimals; the deep-seated desire for vengeance of a deputy sheriff—these forces speed this taut story toward its terrifying end.

HUMPHREVILLE, F. T., adaptor. *The Years Between*. Chicago 11: Scott, Foresman and Co. 1953. 345 pp. $2. This is a group of twelve stories for teenagers to enjoy and grow on. This new collection of short stories has been adapted for easy reading and planned for school use. They form a group of modern tales that should get teenagers chuckling, reminiscing, and thinking as the plots reveal experiences and problems typical of adolescence. Well-known authors such as Walter Edmons, Howard Brubaker, Jess Stuart, and Norman Katkov wrote stories which first appeared in leading magazines. Mrs. Humphreville, a Connecticut teacher, selected and simplified them for use in this book. The collection will fill many school uses. It's suitable for short-story units in the English class or short-story reading interspersed throughout the year's work. It fits in, too, as supplementary reading for everyday, family life units in literature. Teachers of health, guidance, and human relationships will also find in these stories valuable discussion leads, for each story highlights typical adolescent problems and experiences. Headnotes help students relate each story's theme to their own everyday experiences. Then group discussion is recommended to help them apply any new insights gained to their own personal problems.

INGEBRIGTSEN, H. R. *Roaming with Reta*. New York 1: William-Frederick Press. 1954. 123 pp. $2.50. This is an interesting story of the day-to-day life of a veteran commercial fisherman—a saga of men and ship.

JOHNSON, ENID and MARGARET. *Sally's Real Estate Venture*. New York 18: Julian Messner. 1954. 190 pp. $2.50. Beautiful Sally Mackenzie, brought up in the lap of luxury, finds on her father's death that her legacy is small—just an old, heavily mortgaged family property and a small insurance policy. Her only assets are youth, intelligence, enthusiasm and charm, but on the debit side is a complete lack of any practical training that can help her earn a living. She can stay with relatives and attend secretarial school, but neither of these prospect appeals to Sally. So she decides to sell the estate and raise enough money to see her through college.

KARRAKER, W. A. *The Bible in Questions and Answers*. Volume I. New York 17: David McKay Co. 1953. 874 pp. $7.50. This book provides a new approach to the study of the Bible. Here, in Volume I of this work, is the Old Testament

from Genesis to Malachi—analyzed in over 4,000 searching questions and their revealing answers, with documented footnotes reflecting the most modern research on all the facets of Biblical study. Together with Volume II—The New Testament, covering Matthew to Revelation—this book will provide an encyclopedia guide to the study of the Holy Scriptures. Based on the King James Bible, with annotations from the American and Revised Standard Versions, it is inter-denominational in spirit and provides the constructive approach to the study of the Bible required by all lovers of the Word. As a result this book has been endorsed by scholars in many Protestant denominations. Essential as a comprehensive, easy-to-use reference book, every page sheds light, gives information, and makes fascinating and inspiring reading.

LAMBOURNE, NORAH. *Dressing the Play.* New York 16: Studio Crowell. 1954. 96 pp. (7" x 9¾") $4.50. Here are helpful suggestions as aids to the person who directs plays. The author deals rather thoroughly, but with a keen sense of the practical, with the costuming of the characters in the play.

LARSON, G. LaF. *Business English Essentials.* New York 36: McGraw-Hill Book Co. 1954. 176 pp. $1.80. This is a text-workbook especially designed for the short, intensive course in the fundamentals of English. Its course development sets no specific boundaries among the various elements of business English training. All are treated as one unit. All grow out of one another in easy, logical sequence. Thus, the book begins with grammar and spelling, with punctuation study started shortly afterward. As soon as the pupil has acquired a basic knowledge of these fundamentals, he goes right on to the writing of the business letter. All unnecessary explanation and discussion have been eliminated in order to present an English program that can be taught 30 to 40 hours. The text is divided into 12 sections, making it easily adaptable to the 12-week system or the more concentrated 6-week course. Worksheets are arranged at the end of each section for easy review and survey. Upon their removal, the book becomes a handy desk reference that the pupil will find as helpful on the job as it was in the classroom.

LORD, WALTER, editor. *The Fremantle Diary.* Boston 6: Little, Brown and Co. 1954. 320 pp. $4. Here is a firsthand, contemporary account of the Confederacy at flood tide. It is the diary of Lieutenant Colonel Arthur James Lyon Fremantle, a young English army officer who visited one famous Confederate leader after another on his way from Texas to Gettysburg during the most exciting days of the Civil War. A sensation in 1863, it is now republished for the first time in ninety-one years.

MANN, W. B. *Doctors Are People.* New York 1: Vantage Press. 1954. 91 pp. $2. This story is based on the author's actual experience as a county doctor during a six-year period in several small towns in Canada and the United States. It is the story of a young doctor who would not compromise.

McLOUGHLIN, EMMETT. *People's Padre.* Boston 8: Beacon Press. 1954. 288 pp. $3.95. This is the story of a man whose most burning desire was to spend himself to bring health, hope, and purpose to other human beings who had none of these things. It is as simple as that. But the story delivers a powerful impact, because a man like this finds opposition everywhere—even from the rulers of his own church.

MUNRO, D. J. *Commodore John Paul Jones, U. S. Navy.* New York 1: William-Frederick Press. 1954. 109 pp. $3. It was an unequal battle, the one between the British frigate *Serapis* and the American ship *Bonhomme Richard.* The *Serapis* was a large, new vessel, the *Richard* was old and poorly manned. The *Richard*

was on fire in a dozen places, its colors shot away. But when the British captain demanded his surrender, the American commander, John Paul Jones, replied with the immortal words: "I have not yet begun to fight!" And incredibly enough, all that was needed was to hold out a little while longer. During those last agonizing moments, one of Jones' men threw an armful of hand grenades near the British ship's ammunition, and soon the *Serapis'* deck was the scene of a scorching blast. The impossible had happened: the Americans had won. And the reason was the magnetic personality of John Paul Jones.

NEILL, STEPHEN. *Under Three Flags.* New York 10: Friendship Press. 1953. 192 pp. $2. There is so much confusion and misunderstanding in Western minds about conditions in India and Pakistan—not to mention Ceylon, which to many people is vaguely associated with tea—that this book comes as a great and welcome clarifier. Here are three countries, the largest one facing Communist controlled China and Tibet along a great part of its frontier, two providing front page news almost daily, all three with different religious backgrounds, different forms of democracy, and their own complex problems. It is no flight of fancy that prompts the author to say that "decisions taken in the next few years in that part of the world will have the gravest significance for North American and the whole of the West."

NEVINS, ALLAN. *Ford: the Times, the Man, the Company.* New York 17: Charles Scribner's Sons. 1954. 708 pp. $6.75. The present book, written under the auspices of Columbia University, sets forth the conditions prevailing in the eighteen-seventies as Henry Ford, and a dozen others who would become automotive pioneers, grew to manhood. It describes the forces and men that produced the gasoline engine and the first automobile. It tells how Henry Ford as a youth felt impatient with farm drudgery and vaguely determined to end it; how from a machinist's apprentice he rose to the post of engine expert and operating engineer, then by invention and adaptation produced a horseless carriage; how with the formation of the Ford Motor Company he conceived of a light, cheap car and eventually made it a reality by developing mass production to a new point of efficiency. Here too is the astounding account of the financial success that attended mechanical accomplishment—a success that saw $28,000 in cash multiplied to a fortune eventually worth a billion. Through these first fifty years of his life Ford held firmly to the belief that the automobile could and must be "democratized," while it was he who in 1914 dared to establish the $5 day with its revolutionary assumptions that higher pay would justify itself in terms of production, give the workers a larger share of what they earned, greater self-respect, and a better standard of living.

This, therefore, is the record of a mechanical, economic and social revolution as traced in the story of one of the great industrial organizations of the United States and the men associated with it—the story of an age and a movement as well as that of a company and its head. The background and beginnings of the automobile in both Europe and America, the Ford family and the pioneer heritage they passed on to Henry Ford, the surge of the young industry from 1896 to 1915, the first automobile races, the bicycle and its influence, the coming of modern roads—all are covered with a richness and authoritative detail which will stir and satisfy the reader. Here is an interpretation of America and American industry in a great period of creation and growth.

NUNZIO, GAETANO. *Where to, Italy?* New York 1: William-Frederick Press. 1954. 121 pp. $2.50. This novel is the story of San Marino's man of genius, the man who could see what others were afraid to see. Into the restless and troubled

Italy of our time comes young Eddie Wilson, ace news photographer from New York, on a risky assignment to "get the story" on Italy in mid-century. His mission leads him to the strange little man of genius who finally convinces him that men of integrity can stand on their own under the great pressures of superstitions and orthodoxies.

O'CONNOR, PATRICK. *The Society of Foxes*. New York 17: Ives Washburn. 1954. 192 pp. $2.50. The Society of Foxes was an organization of spies, operating as highwaymen in England. Though most of its members were Frenchmen, its leader was an English renegade. Whenever the elegantly dressed highwaymen rode, the countryside was filled with the barking of foxes. On a particular night in 1801, when England was at war with Napoleon's France and traitors were after the King's mail, foxes were heard at the edge of London for the first time in years. Dick Wenting, sixteen-year-old potboy at the inn, unexpectedly gets a chance to act as guard on the royal mail stagecoach. With Tom Simmons the driver, he finds himself through odd circumstances thrown into the very midst of an amazing adventure which brings to life a fascinating piece of history.

PFAENDER, A. M. *Miss Library Lady*. New York 18: Julian Messner. 1954. 184 pp. $2.50. This is a story about a girl who loved books and travel and who, through library work, found romance and an exciting, happy life in Hawaii.

PRICE, B. E. *Across the Years*. New York 1: William-Frederick Press. 1954. 62 pp. $2. Does the key to happiness lie in life's grand prizes—or in the quiet everyday things? Most certainly in the latter, according to the author. And through her poems she shares her enjoyment of nature, her love of family and friends, and her everlasting faith in God.

PRICE, R. G., and MUSSELMAN, VERNON. *General Business for Everyday Living*. New York 36: McGraw-Hill Book Co. 1954. 576 pp. $3.20. This book employs an interesting and practical consumer-economic approach to the study of business. Through a pattern of exploration and guidance, the text leads, stimulates, and encourages the pupil to identify himself as an effective business worker, citizen, and consumer. Then it broadens the concept of business operation to include all of the important phases of specialized business operation. Included in the pattern are guidance information, career exploration, consuming training, and skill development in arithmetic, vocabulary, and reading. It is written in a lively style and so organized to require minimum teacher supervision. It is a community-centered, "doing" program supported by a *Workbook* and easy-to-use *Objective Tests*. The accompanying *Teacher's Manual* and *Key* gives complete course outlines and source information on visual aids and supplementary materials. The book is divided into 12 units and 54 parts. Each unit contains a preview for ease of study and presentation, questions, word studies, arithmetic application problems and projects.

RUSHMORE, HELEN. *Ghost Cat*. New York 17: Harcourt, Brace and Co. 1954. 150 pp. $2.50. Ten-year-old Glory didn't believe in all the superstitions that were handed down in the Ozark Mountain community where she lived. She was sure no ghost haunted the old deserted Rose house at sunset, even though Miss Nancy Rose had died there supposedly of a broken heart. Len was older than Glory, but he wouldn't have anything to do with haunted houses or eerie caves, so Glory went off by herself to the house of sunset to prove Len was wrong. And it was there she found a lovely stray white cat that immediately attached itself to her. Everyone knew it brought bad luck to take a stray cat and Glory's family came near to making her give up the

cat, named Miss Nancy Rose after the ghost. It was the five-year-old twins who saved the day, and before long everyone loved the cat almost as much as did Glory.

RYAN, DON. *The Devil's Brigadier.* New York 16: Coward-McCann. 1954. 320 pp. $3.50. This is a story of violence, intrigue, and revenge in the days just after the Revolution when immigrants were pushing over the Allegheny Mountains to wrest possession of the rich new lands from the Indians, and when a small group of Spanish noblemen schemed with renegade Americans to seize the entire territory west of the mountains for their king. It was a time when feeling against Tory sympathizers still ran high—when many were driven from their homes, their goods confiscated, their lives often forfeited. So it was that Elijah and Matthew Heath, better known as Big and Little Heath, returned from the war to find their Tory father murdered by the loyalist-hating Regulators. Elijah binds his brother by an unbreakable oath to take the life of every man responsible for the murder.

SHERIDAN, DORIS. *The Whole World Will Love Me.* New York 1: William-Frederick Press. 1954. 348 pp. $3.75. This is the story of Saint Therese.

Staff Papers Presented to the Commission on Foreign Economic Policy. Washington 25, D. C.: Supt. of Documents. 1954. 547 pp. $1.75. This book contains papers and charts prepared by a staff of specialists who prepared memoranda for the Commission for an understanding of the issues.

STAUBACH, C. N., and WALSH, J. W. *First-Year Spanish.* Boston 17: Ginn and Co. 1954. 502 pp. $3.48. This book has been prepared with the aim of putting into the hands of the high-school pupil a text which will help him to use with confidence and correctness a simple, serviceable, lively Spanish vocabulary in restricted structural situations, and which will introduce him to the wisdom and the gaiety of Spanish-speaking peoples, and chronicle for him, within modest limits, some of the important moments of their history. From the beginning, both teaching and learning are to be done, as much as they can be, orally. The early lessons use the *serie* technique of the psychological method. The pupil begins at once to hear the spoken language, in short sentences that develop out of one another naturally, and to learn to recognize meanings; then to imitate what he hears. This is the process by which every normal human being learns his native tongue. Later he analyzes both the sounds of the language and the patterns of its structure, which, from hearing over and over again, from memorizing, and from endless repeating, are on the way to becoming second nature to him. As soon as practicable, the pupil applies his recognizing and imitating skills, within carefully controlled limits, to reading and writing and finds to his delight that reading is only another kind of recognizing and writing another kind of imitating. He sees that the better he understands the language when it is spoken and the better he speaks it himself, the better he reads and writes; and, conversely, that his reading skill is strengthened by his hearing skill and his writing skill by his speaking skill. In short, he finds that each of the four skills is so involved with the other three that, when he seems to be directing his attention to one of them, he is indirectly sharpening each of the others.

STEELE, W. O. *Winter Danger.* New York 17: Harcourt, Brace and Co. 1954. 183 pp. $2.25. Caje Ami's father was a woodsy. He had no trade; he didn't farm or keep a store or run an inn. All he knew how to do was follow the bears and deer through the woods and sleep in caves and hollow trees. But if eleven-year-old Caje could have had his way, he wouldn't traipse through the woods, cold and wet and hungry half the time—he'd choose to sleep in a cabin by a fire like other folks, at

least come winter. Only after an almost fatal encounter with Chickamauga Indians and a spectacular mass migration of thousands of squirrels toward the south, a sure sign of a hard winter to come, did Caje's father finally decide to head back toward the Holston River in Tennessee, where Caje's Uncle Adam Tadlock and his family lived. Caje could hardly contain his joy. They'd spend the winter in a cabin with his ma's own brother's family, Caje's own folks whom he'd never seen!

STEINBERG, S. H., editor. *Cassell's Encyclopaedia of World Literature.* New York 10: Funk and Wagnalls Co. 1954. Two volumes, 2,118 pp. $25. This work of literary reference is the product of over five years of research and compilation. It is designed to give its readers the entire historical panorama of world literature from the earliest oral traditions to the present and to convey the salient biographical and bibliographical facts about the great writers of the world. Its scope in terms both of time-span and geography is total; it includes the whole spectrum of world literature, literary history, and literary movements, and a definitive gallery of the men and women who have written the world's great works. Anyone who reads, writes, studies, or uses books will find it invaluable and authoritative. This work contains approximately 1,500,000 words in a compass of 2,118 pages. Two hundred and thirty scholars and critics of more than thirty different nationalities have written entries for this Encyclopaedia; all the contents are wholly new and specially commissioned for this work. Eighty-three literatures of the world are covered in special, individual articles. Much of the information in these and other articles is not available in any other work of reference. There are over 10,000 biographical entries selected by consultation with scholars and experts in dozens of countries and institutions. Each biography is accompanied by a bibliography. The Encyclopaedia contains 574 pages of articles on literatures and literary topics, all specially prepared and written for the work.

SWIGGETT, HOWARD. *The Power and the Prize.* New York 18: Ballantine Books. 1954. 335 pp. $3.50. Cleves Barwick is a bachelor of forty, attractive, and highly successful. He heads a three-man mission to London to effect a business deal with huge, international implications. But the most important thing to him soon becomes the woman he falls in love with during his stay there.

TAIT, J. W. *Fighting Wagons to Sante Fe!* New York 1: Vantage Press. 1954. 276 pp. $3. Young people will find thrills in every step of the route along which handsome young Ben Woodland and his beautiful wife Emily—who abandoned wealth and social position to marry him—journey in the wagon train, traveling to the picturesque New Mexican trading post, the famous, and notorious Sante Fe. For those who crave excitment, there are accounts of hand-to-hand combat between man and beast, white man and Indian, American and Spaniard, and American and American. Knives, arrows, and guns also play their part, for neither white man nor Indian of that era could afford to be squeamish or, indeed, overscrupulous.

TAYLOR, ROSEMARY. *Ghost Town Bonanza.* New York 16: Thomas Y. Crowell Co. 1954. 248 pp. $3. This is a gay romantic novel whose scene is set in a ghost town. Ralph and Leila, two engaging young people, and a series of hilarious episodes make this ghost town a lively place.

WADLEIGH, CHARLOTTE. *The Miracle of Light and Other Poems.* New York 1: William-Frederick Press. 1954. 53 pp. $2. A group of 53 poems by the author—memories which she holds and heightens.

WALTERS, THORSTINA. *Modern Sagas*. Fargo: North Dakota Institute for Regional Studies. 1954. 239 pp. $3.75. In this book we encounter world-famous names originating in this group of Icelanders and we have the chronicles of their families and the settling and building up their new communities; we read of the interesting methods and good judgment shown by the leaders in picking out the site of the settlements and in helping the people to become accustomed to their new home. But even more important than these historical facts which—until now—have remained almost unknown in the United States in general, is the intimate knowledge the author gives us of the human emotions back of the events. This is much more important than it sounds, for we are learning here of the feelings of a race which had privacy as one of its basic requirements for living, and whose reticence about themselves is a part of their philosophy of life.

WILKINS, VAUGHAN. *Fanfare for a Witch*. New York 11: Macmillan Co. 1954. 280 pp. $3.50. The scene of this novel is set in 18th century England when the traditional ill feeling between the Hanoverian King George II and his heir, Frederick, Prince of Wales, caused a royal feud. The king was succeeded at his death by his grandson, the Prince of Wales having died nine years earlier. The author poses an intriguing problem in his plot of this historical novel.

WRAY, ELIZABETH. *Dress Design*. New York 16: Studio-Crowell. 1954. 96 pp. (7" x 9¾"). This is no ephemeral or superficial book on women's clothes. The author has produced a lasting and essentially practical work covering the whole complex field of dress design—from its poteníalities as a career to its execution as a craft. She draws on her own past experience to explain the role of the dress designer, the training necessary, and the openings available to a qualified person in the industry. She shows how fashions are born, or made, in Paris and London and how they are then related to the mass market. The creation of the classic evening dress and each stage of its development are explained. The chapters on pattern making, grading, sizing, and modeling have been contributed by F. R. Morris.

ZAREM, LEWIS, and CANTWELL, RAY. *Superjet*. New York 10: E. P. Dutton and Co. 1954. 126 pp. $2.50. Bob Hart and his father, Major Hart, formerly of the American Air Corps, have just perfected their new nuclear fuel for jet planes in their isolated New Mexico laboratory when Major Hart is shot at through a window and temporarily blinded by exploding fuel. Thus Bob goes alone to Wright Field to demonstrate the precious X-26 formula to Government officials, leaving his father in the care of their old friend, "Sarge" Marting. Bob and Major Mike Perkins, making a test flight, are attacked over Alaska by unknown enemy planes. Later, in a round-the-world non-stop flight in a jet, using the new fuel, they are again attacked. By whom? Who gave away the secret of their flight? Above all else, who had fired the shot which had nearly killed Bob and his father?

Pamphlets for Pupil-Teacher Use

ARTER, R. M. *Mid-City*. Human Relations Monograph 3. New York 11: Center for Human Relations Studies, New York University, 157 W. 13th St. 1953. 32 pp. 50c. A study of human relations in the area of Manhattan.

Cardinal Principles of Secondary Education. Washington 25, D. C.: Supt. of Documents. 1918. 15c. Prepared back in 1918, this booklet is still in demand, reports the U. S. Office of Education. In presenting these principles, the writers bring out the importance of education in a democracy and the objectives of the

secondary school. The booklet includes statements on secondary curriculums, organization, functions of secondary education, and the relationship of the high school to the elementary school.

CLOSE, KATHRYN. *Do You Need A Lawyer?* New York 16: Public Affairs Committee, 22 E. 38th St. 1954. 28 pp. 25c. This pamphlet tells when and why one is likely to need legal help, and how to go about getting it.

The College Entrance Board. Princeton, N. J.: College Entrance Examination Board, c/o Educational Testing Service, Box 502. 1954. 127 pp. 50c. The 52nd report of the director for the period October 1, 1951, to June 30, 1953.

Courses for Dental Hygienists. New York 32: School of Dental and Oral Surgery of the Faculty of Medicine, Columbia University, 630 W. 168th St. This folder informs readers of the material available, is free of charge and available in unlimited quantity. The profession of the dental hygienist is little known by young women who seek information about careers. It is a comparatively new professional field for women. The demand for properly trained personnel far exceeds the faculties for educating them at this time.

Decision-Making and American Values in School Administration. New York 27: Bureau of Publications, Teachers College, Columbia University. 1954. 96 pp. $1. This publication presents the efforts of a group of college professors and school executives to explore the basic values upon which decisions must rest in a free society. It reflects a conviction that the decision-making process in educational administration deserves much more study than it has received in the past.

Defense Against Recession: Policy for Greater Economic Stability. New York 22: Committee for Economic Development, 444 Madison Ave. 1954. 64 pp. Single copies free. This new study, the result of approximately two years of research and discussion involving many of the nation's leading businessmen and economists, is a long-range appraisal of the country's ability to resist and recover from economic declines. The statement makes numerous recommendations for business and government policy.

DODSON, D. W. *Between Hell's Kitchen and San Juan Hill.* Human Relations Monograph 1. New York 11: Center for Human Relations Studies, New York University, 157 W. 13th St. 1952. 32 pp. 50c. A survey of Puerto Rican immigrants in a section of New York City.

HAYDEN, M. A. *The Core Curriculum.* Human Relations Monograph 2. New York 11: Center for Human Relations Studies, New York University, 157 W. 13th St. 1953. 30 pp. 50c. A study of ways of building a working relationship between teachers and ninth-grade pupils.

JAMES, E. W., and WEBER, R. A. *School Consultants: Roles Assumed and Techniques Employed.* Austin: H. F. Alves, Director, Univ. of Texas, Box 7666, University Station. 1954. 40 pp. A report of the activities of two persons who were selected to test the value of experience and training in the college professor's off-campus role as a consultant; and thus give the prospective college professor a first-hand look at the off-campus roles played by college professors and state agency personnel.

MASSIMINE, E. V. *Challenges of a Changing Population.* New York 11: Center for Human Relations Studies, 157 W. 13th St. 1954. 36 pp. 50c. A study of the integration of the Puerto Ricans in a west side community of Manhattan.

PRICE, S. W. *Teacher's Handbook*. Greenwich, Conn.: Board of Education, Greenwich Public Schools. 1954. 111 pp. A handbook given to each teacher on the Greenwich staff wherein she can find pertinent information concerning commonly accepted and approved procedures in the Greenwich public schools.

Protecting Public Health. Wilmington, Del.: E. I. du Pont de Nemours and Co. 1954. 32 pp. The story of how one American company contributes toward the public health and protection.

Report to Congress on the Mutual Security Program. Washington 25, D. C.: Supt. of Documents. 1954. 71 pp. 45c. A factual report of the progress being made through mutual efforts toward the vital goal of increased security for our nation and all the free world.

RICE, M. C., and CARLSON, N. A. *Earned Degrees Conferred by Higher Educational Institutions*. Washington 25, D. C.: Supt. of Documents. 1954. 96 pp. 60c. This report carries through the fiscal year 1952-53, the annual report first launched in 1947-48 on earned degrees in institutions of higher education.

SCHOFIELD, E. T., compiler and editor. *Guide to Films in Human Relations*. Washington 6, D. C.: Dept. of Audio-Visual Instruction, NEA. 1954. 96 pp. $1. This is a co-operative project of the Department of Audio-Visual Instruction and the Anti-Defamation League of B'Nai B'Rith. This guide contains annotations of nearly 200 films in the area of human relations, each containing information as to the name of the film, the publisher, the date of first release, the running time, whether black and white or color, whether available on rental or purchase and the price, and an extensive summary. The directory is composed of four parts: an introduction; a subject index of films; an evaluation of films, alphabetically arranged; and a directory of sources.

Three Years of Progress in the Co-operative Program in Educational Administration. Washington 6, D. C.: American Assn. of School Administrators, NEA. 1954. 32 pp. 50c. A summary report of the accomplishments of the Co-operative Program in Educational Administration (CPEA) during its first three years by the AASA.

TUSKEGEE REGIONAL PRINCIPALS' WORKSHOP. *Principals Look at Themselves*. Tuskegee Institute, Ala.: Tuskegee Institute, School of Education. 1954. 75 pp. Discusses professional qualities, making a professional approach to the work, school practices and administration, public relations, evaluation, *etc.* of the principal of the school.

WEAVER, E. C. *Experiments with Gas*. New York 17: American Gas Assn., Educational Service Bureau, 420 Lexington Ave. 1954. 36 pp. A group of experiments designed for use at grades seven, eight, and nine teaching level. For experiments for more advanced pupils see *Advanced Experiments with Gas*, available through most gas companies or write direct to the above address.

What Price Freedom. Washington, D. C.: Office of the Attorney General. 1954. 48 pp. The report on the Eighth National Conference on Citizenship, Vol. 1, No. 8, which covers the major part of the proceedings of the conference, held in Washington, D. C., September 17-18-19, 1953. The Ninth Annual Conference will also be held in Washington. It will open on September 15, 1954, and will close on "Citizenship Day," September 17. Plans are already under way to make this Ninth Conference an inspirational and effective occasion.

News Notes

SAFE DRIVERS' LEAGUE—Conrad High School of Woodcrest, Wilmington, Delaware, has organized a Safe Drivers' League. Before the school asked the pupils, who are qualified to drive, their opinion of this League, the State Police Highway Commission and the National Safety Council were contacted in regard to the plan. They were all very enthusiastic about the plan to make better and safer drivers. The governor of the state, J. Caleb Boggs, expressed the desire to be present at an assembly at which time the certificates and cards would be presented to the members. In addition, at the end of the year of safe and courteous driving, a chevron will be presented to the member of the League. It is felt that this will be an added incentive and an encouragement to others to join this organization. A membership card signed by the principal of the school, C. W. Cummings, is issued to each member of the Conrad Safe Drivers' League. Also a gummed sticker, 4 inches in diameter, on which are the name of the league and the student member, is provided for the card of each member. Each pupil when he becomes a member signs the following pledge: "I, ..., do solemnly pledge before these witnesses that I shall endeavor to follow safe and courteous motoring practices, when actively engaged in driving a motor vehicle. In so doing, I promise to drive a motor vehicle *only* when it is known to be in a safe-operating condition, when driving conditions permit safe operation of such a motor vehicle, and when I know that I am physically and mentally able to operate safely such a vehicle. I further declare that, should I willfully violate my pledge, I automatically forfeit any and all benefits derived from the Conrad Safe Drivers' League, and that I shall surrender any and all emblems or other specific identifications with the Conrad Safe Drivers' League to the directors or officers of the same. I further understand that this is a covenant between me and the Conrad Safe Drivers' League only, and that all identification with the latter shall be removed from any motor vehicle in my possession before permitting it to change ownership. Before these witnesses, I do so pledge." Each pupil pledge is also signed by the principal, the student council president, the sponsor, and a representative of the local police department.

HELP FOR KOREA—Dr. Howard A. Rusk, President of the American-Korean Foundation, announced recently that the American-Korean Foundation would immediately expand its extensive educational program in Korea. Acting under a program developed by the Foundation's Educational Advisory Committee consisting of Dr. Hollis Caswell, Dean, Teachers College, Columbia; Dr. David Henry, Executive Chancellor, New York University; Dr. William G. Carr, Executive Secretary, National Education Association; Mrs. Crystal Bird Fauset, Philadelphia Civic Leader; and Dr. Roland R. De Marco, President, Finch College, and Chairman of the Committee, the Foundation has allocated $235,000 in support of a program which will include leadership training for Korean educational leaders visiting the United States, educational workshops to be conducted in Korea, educational studies and consultations in Korea, development of demonstration centers in Korea, and grants-in-aid to a limited number of Korean students attending American schools. As a part of the three and a half million-dollar program which the American Korean Foundation has conducted in Korea during the last ten months, the Foundation has supplied professional libraries to twenty Korean teacher training institutions, made possible postgraduate study in

the United States for Korean educational leaders, provided scholarships for sixty students in Korean colleges. Established a center for the advanced teaching of English at Seoul National University, provided Korean language typewriters, duplicating machines and supplies to prepare teaching materials as a temporary substitute for textbooks, and is paying the tuition to permit 2,500 Korean orphans to attend Korean public schools. The Foundation's offices are located at 345 East 46th Street, New York 17, New York.

DAVI INAUGURATES AUDIO-VISUAL SERVICES PROGRAM—Audio-visual services to school administrators have been consolidated into a program by the Department of Audio-Visual Instruction of the National Education Association. Improved use of audio-visual services by the schools is the aim of the over-all program. New developments in the uses of filmstrips, motion pictures, recordings, radio and television, selected pamphlets on subjects related to the field, and the consultation of the nation's foremost audio-visual specialists have been made available to members. Three how-to-do-it brochures have been published by the DAVI so far as part of the program. Newest is the *AV Instructional Materials Center*, which covers in its 80 pages the organization and equipment of a center.

SPECIAL AID GIVEN STUDENTS HAVING READING PROBLEMS—In its first year, the Reading Improvement Service at the University of Michigan gave classes in reading techniques for 331 students. The Reading Service was established a year ago as part of the campus Bureau of Psychological Studies, and enrollment in its classes is entirely voluntary. Students may be referred to the Service by their instructors or by other University agencies, but are under no compulsion to take the program in reading improvement. However, lack of reading skill is the basis of academic difficulty for some intelligent students, and student evaluation of the course in reading improvement indicates that they make definite improvement as the result of the instruction.

Students who have special reading problems are given individual help, and 54 students received such tutoring during the 1952-53 academic year. The classes make use of special testing and teaching devices, such as a flashmeter, telebinocular and ophthalmograph. In addition to this direct work with students having reading problems, the University offers, through the School of Education, a course in the teaching of reading improvement techniques. Some of the students from this course assist with the work of the Reading Improvement Service, and others observe and gain experience in the children's reading program of the Neuropsychiatric Institute of University Hospital.

MATHEMATICS TEACHERS' CONVENTION TO BE TELEVISED—The first publicly televised convention of the National Council of Teachers of Mathematics of the National Education Association will be held April 21-24 in Cincinnati. Two mathematics demonstration classes and a review of the convention proceedings will be televised to Cincinnati residents by their public school system. Delegates to the 32nd annual meeting of the Council will examine teaching techniques, research findings, curriculum adjustments for slow and fast learners, and recreational uses of mathematics. Their 22nd yearbook, edited by John R. Clark, Lahaska, Pa., and entitled *Emerging Practices in Mathematics Education*, will be available for the first time at the convention.

MIDWEST TRAINING CENTER IN HUMAN RELATIONS—Urbana Junior College of Urbana, Ohio, has announced that a two-week summer laboratory will be held from August 15 to 27, 1954. This program will provide intensive training in

the understanding and leadership for people who work with such groups as community leaders, educators, public health workers, labor leaders, social workers, religious leaders, business and industrial leaders, and government officials. Participants will have opportunities for learning to recognize and solve the problems of discussion, policy-making, study, and action groups. Persons interested in improving the morale and effectiveness of staff meetings, committees, or community organizations will find help in this summer training. Actual experience in small groups serves as a basis for learning about inter-personal relations. Participants and staff form a small integrated community where experience may be shared both formally and informally. General principles of group dynamics will be presented along with specific methods leaders can use. Those who attend the laboratory will be aided to develop sensitivity to their own ways of working with people. The laboratory will use the facilities of Urbana Junior College, Urbana, Ohio, on a wooded campus in the west-central part of the state. Recreational facilities such as swimming, tennis, and golf are available. The location insures an opportunity to do concentrated work in an atmosphere free from distraction. The group will be limited to a total of fifty participants, selected on the bases of occupation and potential value of the training to the applicant. Tuition for the two weeks is $50. Room and board costs $35 per week. For application forms write to Edward F. Memmott, Executive Secretary, Midwest Training Center in Human Relations, Urbana Junior College, Urbana, Ohio.

LAY FOUNDATION FOR MODERN EIGHT-STORY OFFICE BUILDING AT NEA HEADQUARTERS—Concrete is being poured now for the foundation of a modern eight-story office building, which is the first in a series of units in the new $5 million education center now under construction by the National Education Association in Washington, D. C. The first section of the center will cost approximately $1,315,000. Wrecking crews began razing the garage-annex at NEA headquarters in December to make way for the new office building. The initial structure is expected to be completed within a year. Plans call for finally razing all but one of the present buildings, which include a hotel and an apartment building in addition to the garage.

"The new education center is one of the most significant milestones in the history of American education," comments William G. Carr, executive secretary of the National Education Association "It is being built largely by members of the organized profession and will make a great contribution to the development of adequate educational programs and teaching skills." Completion of the entire project is scheduled for 1957 at which time the the NEA plans to observe its centennial in Philadelphia where the organization came into being in 1857.

URBANITES TAKE NOTE—Farm population has decreased about 20 per cent since 1940! It was estimated in 1952 at 23,276,000 or 15 per cent of the U. S. total. In the same period, the rural non-farm population has increased about 20 per cent. Urban population has increased about 20 per cent since 1940 and now constitutes 64 per cent of the United States total.

NATIONWIDE POLIO VACCINE TESTS—Two methods of conducting the nationwide polio vaccine tests this spring are being followed by the National Foundation for Infantile Paralysis. In seven states (Alabama, Maryland, Michigan, Montana, New York, Utah, and, Washington) half the school children in the first, second, and third grades in selected counties are given the trial vaccine and the other half are given an ineffective substance. In other states, children in the second grade only receive the vaccine, with first- and third-grade pupils acting as statistical controls.

Some 500,000 to 1,000,000 children will have participated in these trials before early June.

The combination of these two plans will assure a valid evaluation of the trial vaccine. In case the amount of trial vaccine available is less than that originally contemplated, the Committee recommended that by far the larger part of it be used in areas where the first plan can be properly administered. Because of the necessity for additional facilities such as accessible virus research laboratories, only a few states have been selected to conduct the studies involving the giving of the vaccine to one half the children in the first three grades. The vaccine field trials began in early April.

Detailed minimum standards for the preparation of the vaccine, approved by the Committee, have been sent to all state health officers. These standards incorporate "every reasonable safeguard possible," the Committee declared. "The data reviewed by the Committee indicated that the three strains of virus are being produced in quantity"; the Committee's letter stated, "that techniques are available for their inactivation, with rigid control for purity and safety; and that it is possible to conduct a controlled field study of its efficacy in the prevention of paralytic poliomyelitis. Since safety is of the utmost concern, the Committee has reviewed carefully a series of minimum standards prepared with the help of members of the Committee and a member of consultants. The Committee has recommended that these minimum standards be established for all material to be used in any field trial sponsored by the National Foundation. In the opinion of the Committee, every reasonable safeguard possible has been incorporated in these standards. Since three separate laboratories will be carrying out the safety tests, chances of error will be remote indeed." Dr. Thomas Francis, Jr., Chairman of the Department of Epidemiology in the University of Michigan School of Public Health, will direct an independent evaluation of the results of the trials.

COLLEGE SCHOLARSHIPS FOR BUSINESS STUDENTS—Scott Paper Company of Chester, Pennsylvania, has established a two-year scholarship award at Pennsylvania Military College to be presented annually for the next four years to the outstanding member of the sophomore class planning to follow a business career, it was announced recently by Major General Edward E. MacMorland, President of PMC. The scholarship, to be known as The Scott Award at Pennsylvania Military College, will provide $1,000 a year to the student selected. It will be initiated in June and the first presentation will be made to a member of the graduating class of 1956. Along with the scholarship, Scott Paper Company will contribute $1,000 each year to PMC.

This is the second such scholarship established by Scott Paper Company in an experimental program introduced last year at Swarthmore College. Andrew J. Schroder, 2nd, Secretary and Director of Industrial Relations of Scott Paper Company, said the scholarships will not only provide financial assistance to the colleges concerned but, facilitating the recruitment and training of college-level graduates, will directly benefit the company as well.

Eligible candidates must have signified their intention of entering business and must have clearly demonstrated in extracurricular activities, as well as in the classroom, those qualities associated with Rhodes scholars, General MacMorland said. He listed these as literary and scholastic ability and attainments, qualities of manhood, truth, courage, devotion to duty, sympathy, kindliness, unselfishness and fellowship, exhibition of moral force of character and of instincts to lead and to take an interest in schoolmates, and physical vigor as shown by an interest in outdoor sports or similar activity. Candidates will not be restricted by reason of the student's family income level since

the primary purpose of the Scott Award is to stimulate and reward the successful recipient regardless of his financial status.

General MacMorland said that each winner of the Scott Award will be offered summer employment, strictly on an optional basis, with Scott Paper Company at the conclusion of his sophomore and junior years. He added such employment will be of a nature calculated to further the student's educational program.

"Naturally the company is hopeful that upon graduation sufficient recipients of the award will join its organization on a permanent basis to make the experiment productive as an aid to recruitment, but neither the company nor the recipient is under obligation with respect to employment after graduation," Schroder stated. He stated further that the concept underlying this award is to stimulate students who expect to enter business to strive for a proper balance of desirable personal qualities and not to limit themselves to any one particular area of interest, whether it be scholarship, athletics, dramatics, social life, or any other specific extracurricular activity. He pointed out that success in highly competitive enterprise requires men and women of intelligence, tact, persuasiveness, friendliness, loyalty, enthusiasm, integrity, and, above all, the ability to get along with others. "While high scholarship should be respected and encouraged, it should not be valued above such traits as strong character, pleasing personality, native intelligence, physical well being and social adaptability. A proper balance among all these qualities is often indicative of the potential business leader," Schroder said.

General MacMorland said that before June, 1959, Scott Paper Company and PMC will have appraised the program and mutually decided whether it has been sufficiently successful to be continued.

NEW EDUCATIONAL FILM—The sponsor of a new and different kind of educational film, *Nations United for Spring Beauty*, has given permission for the release of this interesting film story for general use, including schools. Heretofore, it has been available to adult groups only. This is a two-reel, 20-minute, 16mm., color, sound film, with clear American narration, sponsored by the Associated Bulb Growers of Holland. Every year thousands of crates of healthy flower bulbs reach this country from the Netherlands where bulbs are big business. This is the fascinating story of research, labor, and inspection that combined produce the tulips, daffodils, hyacinths, and other bulb flowers for which Holland is famous. It's the law that no bulb, seed, flower, tree, or shrub may enter the United States without clearance by Plant Quarantine Inspectors from the Bureau of Entomology of the United States Department of Agriculture. Before 1951 this inspection was carried out on our shores. But then the Dutch Bulb Exporters Association initiated a more efficient system, inviting the quarantine officers to make their inspection on the spot—in the fields, bulb sheds, packing houses, and on the loading docks. Nowadays the Netherlands Phytopathological Service which conducts its own constant inspection, the Dutch Bulb Research Laboratories, and five United States quarantine officers work together in a spirit of international co-operation to ensure quicker delivery to this country of only the heartiest bulbs.

Delightful to view because of the exciting color photography of flowers, this enlightening film is also instructive and educational, the technical scenes detailed and informative. An unusual film of general interest to all and of particular interest to many, this film is available, free of charge, except for transportation both ways, from Films of the Nations, 62 West 45th Street, New York 36, N. Y. Inquiries will be referred immediately to the nearest Regional Distributor. *Nations United for Spring Beauty* is also cleared for television use and can be booked for this purpose directly through the New York Office of Films of the Nations, free of charge.

This table below, showing the extent to which eligible 1953 college graduates entered teaching, is taken from the Seventh Annual National Teacher Supply and Demand Report, prepared by Ray C. Maul, Assistant Director, NEA Research Division. The full report was published in the *Journal of Teacher Education*, March, 1953. Reprints are available at 50 cents each from NEA Publications and Sales, 1201 Sixteenth Street N. W., Washington 6, D. C.

OCCUPATION, ON NOVEMBER 1, 1953, OF PERSONS WHO GRADUATED BETWEEN SEPTEMBER 1, 1952, AND AUGUST 31, 1953, WITH QUALIFICATIONS FOR STANDARD TEACHING CERTIFICATES

In Connecticut, Hawaii, Illinois, Kansas, Kentucky, Michigan, Minnesota, Missouri, Nevada, New Mexico, Utah, Vermont, Wisconsin, and Wyoming*

Field of preparation	Teaching		Not teaching														Total	
			Otherwise gainfully employed		Continuing formal study		Military service		Homemaking (women)		Seeking teaching job		Seeking non-teaching job		No information			
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Elementary																		
Men	1,054	55.7	151	8.0	177	9.3	266	14.0	0	0.0	7	0.4	4	0.2	235	12.4	1,894	100.0
Women	7,153	81.7	163	1.9	145	1.6	5	0.1	354	4.0	26	0.3	8	0.1	899	10.3	8,753	100.0
High School																		
Agriculture																		
Men	183	44.2	48	11.6	17	4.1	109	26.4	0	0.0	1	0.2	1	0.2	55	13.3	414	100.0
Women	1	4.4	7	30.4	2	8.7	0	0.0	11	47.8	0	0.0	0	0.0	2	8.7	23	100.0
Art																		
Men	70	42.7	15	9.1	18	11.0	32	19.5	0	0.0	2	1.2	0	0.0	27	16.5	164	100.0
Women	197	65.9	11	3.7	12	4.0	0	0.0	28	9.4	3	1.0	2	0.7	46	15.3	299	100.0
Commerce																		
Men	162	39.6	84	20.5	21	5.1	86	21.0	0	0.0	2	0.5	0	0.0	54	13.3	409	100.0
Women	292	65.5	64	14.4	9	2.0	0	0.0	38	8.5	10	2.2	1	0.2	32	7.2	446	100.0
English																		
Men	183	43.1	35	8.2	56	13.2	100	23.5	0	0.0	1	0.2	2	0.5	48	11.3	425	100.0
Women	621	71.7	57	6.6	40	4.6	0	0.0	45	5.2	11	1.3	4	0.5	88	10.1	866	100.0
Foreign Language																		
Men	39	30.4	2	1.6	46	35.9	17	13.3	0	0.0	2	1.6	1	0.8	21	16.4	128	100.0
Women	103	58.8	10	5.7	10	5.7	1	0.6	8	4.6	4	2.3	1	0.6	38	21.7	175	100.0
Home economics																		
Men	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Women	651	69.9	57	6.1	18	2.0	1	0.1	85	9.1	3	0.3	1	0.1	116	12.4	932	100.0
Industrial arts																		
Men	369	53.3	79	11.4	30	4.3	112	16.2	0	0.0	2	0.3	0	0.0	100	14.5	692	100.0
Women	0	0.0	0	0.0	0	0.0	0	0.0	1	100.0	0	0.0	0	0.0	0	0.0	1	100.0

Journalism																		
Men	6	50.0	1	8.3	2	16.7	1	8.3	0	0.0	0	0.0	0	0.0	2	16.7	12	100.0
Women	3	30.0	3	30.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	4	40.0	10	100.0
Library science																		
Men	9	52.9	1	5.9	1	5.9	4	23.5	0	0.0	0	0.0	0	0.0	2	11.8	17	100.0
Women	67	75.3	10	11.2	2	2.3	0	0.0	2	2.3	1	1.1	0	0.0	7	7.8	89	100.0
Mathematics																		
Men	165	39.3	37	8.8	42	10.0	119	28.3	0	0.0	2	0.5	1	0.2	54	12.9	420	100.0
Women	111	64.1	19	11.0	11	6.3	0	0.0	14	8.1	2	1.2	1	0.6	15	8.7	173	100.0
Music																		
Men	226	49.9	16	3.5	43	9.5	110	24.3	0	0.0	2	0.5	0	0.0	56	12.3	453	100.0
Women	432	74.3	26	4.5	25	4.3	2	0.3	28	4.8	2	0.3	0	0.0	67	11.5	582	100.0
Physical education																		
Men	471	42.6	89	8.1	58	5.2	305	27.6	0	0.0	14	1.3	1	0.1	167	15.1	1,105	100.0
Women	402	75.4	17	3.2	27	5.1	4	0.7	36	6.7	2	0.4	0	0.0	45	8.5	533	100.0
General science																		
Men	111	41.0	24	8.8	30	11.1	47	17.3	0	0.0	1	0.4	1	0.4	57	21.0	271	100.0
Women	38	54.3	7	10.0	4	5.7	0	0.0	6	8.6	0	0.0	0	0.0	15	21.4	70	100.0
Biology																		
Men	83	33.8	21	8.5	36	14.6	60	24.4	0	0.0	2	0.8	0	0.0	44	17.9	246	100.0
Women	47	52.2	12	13.3	8	8.9	0	0.0	6	6.7	1	1.1	0	0.0	16	17.8	90	100.0
Chemistry																		
Men	37	24.2	27	17.6	32	20.9	45	29.4	0	0.0	0	0.0	0	0.0	12	7.9	153	100.0
Women	13	39.4	10	30.3	8	24.2	0	0.0	2	6.1	0	0.0	0	0.0	0	0.0	33	100.0
Physics																		
Men	29	39.1	11	14.9	11	14.9	17	23.0	0	0.0	0	0.0	0	0.0	6	8.1	74	100.0
Women	0	0.0	0	0.0	1	100.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	100.0
Social science																		
Men	500	40.3	96	7.7	136	11.0	281	22.7	0	0.0	11	0.9	2	0.2	213	17.2	1,239	100.0
Women	227	51.3	55	12.5	28	6.3	1	0.2	46	10.4	3	0.7	2	0.5	80	18.1	442	100.0
Speech																		
Men	48	29.3	11	6.7	17	10.4	32	19.5	0	0.0	1	0.6	0	0.0	55	33.5	164	100.0
Women	157	52.7	20	6.7	16	5.4	2	0.7	9	3.0	2	0.7	1	0.3	91	30.5	298	100.0
Other																		
Men	223	56.5	32	8.1	94	23.8	31	7.8	0	0.0	2	0.5	1	0.3	12	3.0	395	100.0
Women	171	65.5	30	11.5	13	5.0	0	0.0	17	6.5	0	0.0	0	0.0	30	11.5	261	100.0
High School total																		
Men	2,914	43.0	629	9.3	690	10.2	1,508	22.2	0	0.0	45	0.7	10	0.1	985	14.5	6,781	100.0
Women	3,533	66.4	415	7.8	234	4.4	11	0.2	382	7.2	44	0.8	13	0.2	692	13.0	5,324	100.0

• These are the only states in which complete reports were available from all colleges preparing teachers.

EDUCATE TOMORROW'S PARENTS TODAY—Education for personal and family living—a responsibility shared by schools with parents, youth leaders, and religious organizations—was the keynote of National Social Hygiene Day observed in thousands of communities on April 28, 1954. This accent on an aspect of education must be a satisfaction to all educators, for we have never failed to realize that our responsibilities involve not only the child in the classroom today but also the child's later contribution to his world in marriage and as a parent.

Each generation of children must learn again the things their parents were taught. Many of us regret that previous generations of children—today's parents and grandparents—were not educated for successful personal living and satisfying, happy marriage and parenthood. Perhaps if there had existed the skills, the community understanding, and the teaching materials we have now, many of today's children would have been protected from unhappiness and juvenile deliquency—all too often traceable, in part at least, to parents who never realized that parenthood is a vocation requiring specific education. We have the tools; we can increasingly gain the skills to give every child an integrated program of education for personal and family living. We have far greater parental interest and support today than ever before to make such programs a vital part of school—community relations. We alone can decide how much time, thought, and planning we are willing to devote to the pressingly needed education of tomorrow's parents today.

CATALOG OF TESTS—The California Test Bureau, 5916 Hollywood Blvd., Los Angeles 28, California, has recently prepared a catalog of all tests which they have available. In addition to complete discussions about the tests, the catalog contains information about the company and staff and other descriptive material. Copies of the 80-page booklet may be obtained by writing to the above address.

SAFE DRIVING CHECKLIST AVAILABLE TO SCHOOLS—Hudson Motor Car Company has prepared a Safe-Driving Checklist. The checklist was prepared by traffic experts of Yale and Columbia Universities, and was the instrument for determining the results of a cross-country traffic study. Many thousands of these checklists have been distributed to the public by Hudson dealers and through school systems. In Massachusetts, for example, 50,000 copies were distributed by safety authorities to all 271 schools in the state participating in driver education programs. Other similar distributions have been made in Cleveland, Buffalo, and other major cities. These Safe-Driving Checklists are available from Hudson dealers, or may be obtained directly by writing to Thomas P. Rhoades, Director of Public Relations, Hudson Motor Car Company, Detroit 15, Michigan.

IT SOUNDS INCREDIBLE—But high school-college relationships have been discussed seriously for over 75 years. Articulation between school and university is perhaps the oldest and most controversial problem in American education. Secondary schools have always been hard-put to prepare students for college and at the same time adapt the curriculum to the life-needs of all youth. Some significant things now taking place may help the high school to resolve its time-honored dilemma. *The Fund for the Advancement of Education*, established by the Ford Foundation, is currently sponsoring four projects on better articulation between high school and college.

1. The *first* project, a joint inquiry by faculty members of three schools—Andover, Exeter, and Lawrenceville—and three universities that receive many students from these schools—Harvard, Princeton, and Yale, attempts "to plan the last two years of secondary

school and the first two years of college as a coninuous process, conceived as a whole." This project is reported in *General Education in School and College* (Harvard Univ. Press, 1953), which finds three great weaknesses in the current pattern of articulation. Commenting on college language requirements, for example, the report states: "It is evident that students are spending a lot of time *not* learning to use a foreign language."

2. The *second* project involves co-operation between the public schools system of Portland (Oregon) and faculty members of Reed College on a city-wide program intended to enrich educational opportunities for *gifted children*. This project was an outgrowth of a study of juvenile deliquency which showed that a surprising number of youth getting into trouble were above average in general competence. No report of the project has yet been made, but it is now being carried on in four pilot high schools and ten elementary schools.

3. The *third* project is called the School and College Study of Admission with Advanced Standing. It is studying the questions, Can abler students complete the general education now provided in the last two years of high school and the first two years of college in a shorter time and yet not lose essential values of a liberal education? Can enrichment in high school permit acceleration in college? This project is concerned with acceleration in college, not acceleration in high school. At present 100 school and college teachers and administrators are studying eleven subject matter fields on the college freshman level in which high-school preparation might be enriched; twenty-two secondary schools are co-operating; pilot studies in seven high schools and two colleges are now going on.

4. The *fourth* project is known as the Program for Early Admission to College. Its purpose is to find out whether young but able students may bypass one or two years of high-school work without endangering their college performance and adjustment. During the past year twelve colleges (Chicago, Columbia, Fisk, Goucher, Lafayette, Louisville, Morehouse, Oberlin, Shimer, Utah, Wisconsin, Yale) have been co-operating with Educational Testing Service (Princeton, N. J.) and the Research Division of the Fund in an evaluation of the project. Two groups of students, 362 entering college in 1951 and 414 entering in 1952, are being compared with groups of students of equivalent ability who entered college at the same time but completed secondary school. Results indicate that students with as little as ten years of school compared favorably with high-school graduates with respect to grade-point average and personal adjustment. No report has been released as yet.—*Spotlight*, a U. S. Office of Education Publication.

HOW LONG SHOULD A HIGH SCHOOL DAY BE?—A close look at the daily time schedules of 21 large high schools in various parts of the country shows that most of them have a 7-hour school day. Here are data for length of day and other items:

	Range	*Most Common* (mode)
First class begins	7:55—8:45 a. m.	8:30 a. m.
Last class ends	2:24—4:10 p. m.	3:30 p. m.
Average length of day	2—8 hours	7 hours
No. of periods in day	5—10 periods	6 periods
Average length of period	40—61 minutes	55 minutes
Passing time between classes	3—5 minutes	5 minutes
No. of lunch periods daily	1—4 periods	3 periods
Length of lunch period	25—60 minutes	30 minutes
Average daily length of HR	5—40 minutes	15 minutes

The daily timetable of these large high schools provides lunch periods much shorter than class periods, and home-room periods about one fourth as long as class periods. Are you interested in more representative data on the high-school day? If so, send in your daily time schedule to the Editor of *Spotlight,* Office of Education, U. S. Department of Health, Education, and Welfare, Washington 25, D. C., and information received will be tabulated in a forthcoming issue of *Spotlight.*

WORKSHOP ON HIGH-SCHOOL PUBLICATIONS—The annual 5½-day workshop on high-school publications to be conducted by the School of Journalism at Ohio University, June 21-26, will have a "Sesquicentennial" theme, Prof. L. J. Hortin. director, has announced. The OU Workshop, which began in 1946 as a two-day "conference," reached a record-breaking enrollment last year of 453 students and advisers. These workshoppers came from 142 high schools in six states—Ohio, West Virginia, Pennsylvania, Kentucky, Utah, and Texas. Ohio University, oldest university north of the Ohio River and west of the Alleghenies, is celebrating its 150th birthday in 1954. "As a pioneer institution, we are trying to develop new procedures and techniques through this workshop in journalism," Mr. Hortin explained.

The 1954 workshop is designed for five major high-school groups: (1) editors and advisers of letterpress newspapers; (2) editors and advisers of yearbooks; (3) students and teachers interested in the business phases of newspapers and yearbooks; (4) editors and advisers of mimeographed and offset newspapers; (5) photographs. Special clinics are planned for advisers and for radio-TV journalists.

Two model newspapers will be published by the workshoppers during the session: *The Streamliner,* a mimeographed paper in two colors, and *The Workshopper,* a tabloid size letterpress paper. All participants are asked to bring copies of their high-school newspapers, magazines, and yearbooks for analysis and criticism by the staff.

The sessions will include demonstrations, daily convocations, displays, forums, lectures, field trips, and round-table discussions. The facilities of the OU School of Journalism—engraving plant, typography and photography laboratories, wire service, radio equipment and specialized classrooms—will be utilized by the workshoppers. Plenty of play is promised: picnics, swimming, parties, dancing, picture shows, contests, and sports. Sigma Delta Chi and Theta Sigma Phi, men's and women's professional journalism fraternities, will provide guides and aides for the visitors. No fee will be charged advisers. A laboratory fee of $6 is charged each student attending the workshop. Room and board will be available for students and advisers in the university dormitories for $15 for the entire period. Rooms will be available beginning Sunday afternoon, June 20. Meals will start with breakfast Monday morning, June 21, and continue through Saturday noon, June 26. Requests for reservations and information should be sent to Prof. L. J. Hortin, Box 312, Athens, Ohio.

SUMMER SCHOOL WORK—Cornell University recently announced plans to open its summer courses to more students. Beginning this summer, a student may take as little as one credit hour of course work if he wishes. Formerly he had to enroll for at least four hours of work. Prof. Lloyd H. Elliott, director of the summer session, said the change would benefit students who need only one course for a specific purpose and others who cannot—or do not wish to—spend a full day in the classroom.

The session July 6-August 14 is intended for teachers and other professional persons, graduate and undergraduate students from Cornell and other institutions, and others who would find summer study profitable. More than 200 courses will be given by the Colleges of Arts and Sciences, Engineering Agriculture, and Home Economics; the Graduate Schools of Education, Industrial and Labor Relations, and

Hotel Administration. Some of the courses are shorter than the regular six weeks; intended chiefly for working people who want to use their vacations to help themselves vocationally. A preliminary announcement of the summer program may be obtained from the Summer Session Office, Day Hall, Cornell University, Ithaca, New York.

EUROPEAN STUDY TOUR IN COMPARATIVE EDUCATION—One excellent way of attaining an appreciation of the complex world scene is by a firsthand survey and an "on-the-spot" study of distant countries, especially those of the European Continent. A close contact with Europe's problems is now available to educators in the Seventh Annual European Study Tour in Comparative Education for the summer of 1954. This tour is designed primarily for the professional growth of in-service teachers. It provides a series of carefully planned meetings with educational leaders in the cities and countries visited, as well as an adequate sampling of Europe's sightseeing attractions. Last year nearly two hundred municipal, governmental, school, and university officials generously assisted in making this tour effective in their respective countries.

Some of the outstanding features of the tour are as follows: Trans-Atlantic round trip by air; land transportation throughout Europe by private deluxe motor coach; generally first-class hotel accommodations; three savory meals a day; and a cultural and recreational program in the form of plays, operas, visits to galleries, museums, and historic landmarks. Travel arrangements are of the best quality and are offered at an extremely reasonable cost. The tours will be personally conducted by Dr. William Reitz, Professor of Education of the College of Education at Wayne University who has previously conducted six of these tours. Inquiries should be directed to Dr. William Reitz at the above address.

LIST OF FREE LOAN FILMS—The Princeton Film Center has compiled a new list of free loan 16mm. sound films. Many in full color, these motion pictures are informative and entertaining and well suited for clubs, colleges, industrial and adult audiences. A wide range of subject matter offers timely and thoroughly interesting program material. All requests from users should be sent directly to the Princeton Film Center, Inc., Princeton, New Jersey.

VISITING ASSOCIATESHIPS IN TEST DEVELOPMENT—Educational Testing Service is offering two Visiting Associateships in Test Development for the summer of 1954, one in mathematics and one in social studies. The purposes of these Associateships is to give interested members of the teaching profession an opportunity to become familiar with test construction procedures, to bring fresh points of view to the work of the test development department, and to give members of the test development department staff an opportunity to become more familiar with the problems and current practices in the schools. The Associateships are for two months—July 1 to August 31. There is a stipend of $700 plus reimbursement for round-trip transportation to and from Princeton for each Associate.

Each Associate will be assigned to the section of his subject matter specialty. Following a brief orientation to Educational Testing Service operational procedures, each Associate will work as a member of the section. The exact nature of the work will depend upon the qualifications and interests of the Associate and the needs of the subject matter section. The mathematics section is interested at this time in studying teaching methods in elementary and secondary schools, while the social studies section will be developing tests at the secondary-school level.

No specific qualifications are required, but experienced teachers of mathematics and social studies with an active interest in testing and some background in this field,

either through course work or experience, will receive preference. Selection will be based on scholarship and on previous contributions in the field of education. Applications should include a completed application form and a transcript of all college work, undergraduate and graduate. Applications or nominations for these Associateships should be sent to Miss Edith Huddleston, Educational Testing Service, 20 Nassau Street, Princeton, New Jersey.

PLAYLETS ON PERSONAL AND FAMILY MONEY MANAGEMENT—The Committee on Family Financial Security Education is currently offering without charge to interested teachers and educators throughout the country a series of three playlets on personal and family money management that are adaptable for school assembly group, radio, or television presentation. The three playlets—*Let the Dollar Help, Budget or Bust;* and *Be Sure! Insure!*—were developed and written by teachers who have participated in summer workshop programs that are held at eight leading universities in various parts of the country each year. All of the playlets are graphic as well as humorous in their treatment of money management problems that face individuals as well as families. They can be obtained free of charge by writing to the Committee on Family Financial Security Education, 488 Madison Avenue, New York 22, New York. *Let the Dollar Help,* a fifteen-minute treatment of special interest to seventh-grade pupils, was written by Geraldine M. Flemming of the Dimner Beeber Junior High School of Philadelphia, a participant in the first workshop in Family Finance held at the University of Pennsylvania in 1950. Designed for an assembly program, *Budget or Bust* tells the amusing story of a family who is constantly financially embarrassed and what it did about this recurrent situation. It was written by Sister Mary Fides Gough at the 1952 University of Wisconsin Pro-seminary in Family Finance. *Be Sure! Insure!,* a humorous story of family needs for various types of insurance protection, was written by three teachers who attended the 1952 University of Pennsylvania workshop.

FIVE EUROPEAN STUDY TOURS—Temple University will sponsor five European study tours this summer, all of which give graduate or undergraduate credits, John M. Rhoads, Temple University registrar, has announced. Tour subjects include comparative education, social welfare under different forms of government, music, art of Western Europe, and a French study itinerary which includes a month's study at the Sorbonne.

Under the direction of Dr. Thomas E. Clayton, acting director of the Division of Secondary Education at Temple University, the comparative education tour will study the school systems in seven leading European countries. Leaving New York by air on June 30, the 5,000-mile trip will include examination of the education systems of Great Britain, Holland, Germany, Austria, Italy, Switzerland, and France. Return will be by plane on August 17.

Temple's Social Welfare tour, from July 9 to August 16, is under the direction of Dr. Negley K. Teeters, internationally known for his studies in sociology and criminology and chairman of the Department of Sociology at Temple. The tour will cover Holland, Switzerland, Yugoslavia, the cities of Venice, Nice, Paris, and London. The course will serve as an analytical field survey of the social problems and their attempted solutions in various European countries widely separated by geography, customs, historical background, cultural characteristics, and political development.

Dr. Herman S. Gundersheimer, professor of Art History at the Tyler School of Fine Arts of Temple University, will conduct the nine-week study tour of Western European art. Leaving New York by boat on June 30 and returning August 22, the

tour will explore museums, art workshops, studios, and galleries of seven European countries. The tour participants will have ample time to study the art and architecture of the area to be visited, which include England, Belgium, Germany, Alsace, Switzerland, Northern Italy, Rome, the south of France, and Paris.

Temple's French study offering lists four optional tours in addition to a pair of courses at the Sorbonne, listed to run concurrently from July 15 to August 14. The Sorbonne courses, one on the French language and the other on French civilization, will be preceded by a tour of Great Britain and the Low Countries. Optional tours after the Sorbonne study include a tour of France by motor coach, another covering Switzerland and Italy, and the third, a tour of Spain. All of the last leave Paris on August 14. The program is under the direction of Jane Van Ness Smead, associate professor, and M. Helen Duncan, assistant professor, both of the French Department of Temple.

Under the direction of Wilbert B. Hitchner, associate professor of Music Education at Temple, and Louis G. Werson, director of Music Education of the Philadelphia Public Schools, the music tour offers two listings, with an optional extension section to rural England and Edinburgh. Leaving by plane from New York on July 12, the first section will visit Holland and Paris, the south of France, Italy, Lucerne and Salzburg, Munic, Bayreuth and Bonn, and London. The second group will leave August 1 and, following a week of travel in Holland, Belgium, and Paris, will join the first section at Lucerne. For complete information about these tours write to the Office of Public Information, Temple University, Philadelphia 22, Pennsylvania.

INTERNATIONAL FRIENDSHIP LEAGUE—More than 200,000 American boys and girls are making friends with young people all over the world through the efforts of the International Friendship League. The League has hundreds of thousands of teacher-sponsored letters from students in all countries of the free world. These boys and girls, in nearly every case, have written in English, and they are all eager to have pen friends in the United States. Teachers of history, geography, civics, languages, and social studies find the letters from abroad helpful in the classroom. The International Friendship League has the endorsement of the Department of State, the National Education Association, and the U. S. Office of Education. It is also sponsored by the Ministries of Education in all the free countries of the world. For information, send a self-addressed stamped envelope to the International Friendship League, Inc., 40 Mount Vernon St., Boston, Mass.

HIGH SCHOOL GRADUATES IN COLLEGE—According to the U. S. Office of Education approximately 46 per cent of the 1953 high-school graduates went on to college, in comparison with 31.4 per cent of the 1921 graduates. Of the 1921 high-school graduates, 39.8 per cent of the boys and 22.5 per cent of the girls entered higher education. Of the 1953 high-school graduates, the corresponding figures were 56 per cent of the boys and 36 per cent for the girls. In 1920-21, 8.1 per cent of the college-age group were in college, as compared with 19.3 per cent of the similar age group in 1950.

RADIO IS STILL USED—Television notwithstanding, there were 110,000,000 radio sets in working order in the United States on January 1, 1953, according to recent estimates of the research departments of the four major radio networks. This is an increase of about 5,000,000 over the number of sets on the same date a year before; 44,800,000 radio homes have 30,000,000 extra sets. There are 26,000,000 sets in passenger cars and another 9,000,000 in eating places, hotels, and other public

places. The total sale of radio sets in 1952 was substantially greater than the sale of any other home appliance.

FILMS ON A RENT-TO-OWN PLAN—The Audio-Visual Center of Indiana University, Bloomington, Indiana, has a number of instructional films available on a rental or purchase basis. Prints are available at no cost other than return postage on a preview basis with intent to purchase. Included in this list are:

Introduction to Student Teaching, 20 min., sound, b. and w., $75 (experiences of three student teachers preparing for teaching; suggestions for becoming part of the school, handling the classroom, and working with pupils; a variety of teaching materials for different instructional purposes).

Teaching Intelligence with the Stanford-Binet, 18 min., sound, b. and w., $75 (reactions of four children to various types of items in the Stanford-Binet Intelligence Test, information about the meaning of "mental age" and "intelligent quotient," administration of the Stanford-Binet).

Safety in the Chemistry Laboratory, 15 min., sound, b. and w., $75 (safe practices for handling tools of chemistry, numerous safety rules illustrated, importance of safety habits).

Plan To Live, 17 min., sound, b. and w., $90 (responsibility of the professional chemist in relation to other workers, role of management in the safety problem, necessity for thorough planning before beginning experimentation).

County and Community Recreation in Action, 29 min., sound, b. and w., $100 (case histories of three county-wide recreation programs, various ways of organizing recreational programs on a county or community basis, necessity of trained leadership, benefits of an organized program, activities for all ages through the year, ways in which communities can finance recreational programs).

Marching Band Fundamentals, Part I and II, 21 min., sound, color $175, b. and w. $90; each part separately, color $100, b. and w. $50. (a high-school band demonstrates marching fundamentals).

A Glimpse of the Past, 10 min., sound, color $100, b. and w. $50 (information obtained through the discovery of artifacts and other remains, information used to reconstruct dwellings of early American Indians, information about the early American Indian's food habits, tools, toys, and jewelry).

Learning About the Past, 10 min., sound, color $100, b. and w. $50 (how the scientist locates a village site and unearths evidences of prehistoric American Indian life, how the scientist records and analyzes various types of information about the dig, how the scientists interpret various types of material found on the site).

How To Make Handmade Lantern Slides, 22 min., sound, color $150, b. and w. $75 (how to make six common types of handmade lantern slides—etched glass, gelatin-coated glass, frosted plastic, translucent paper, cellophane typed with carbon, and opague, paper silhouettes; how to bind slides; how to use lantern slides in various subject-matter fields).

Wet Mounting Pictorial Materials, 12 min., sound, color $100, b. and w. $50 (restoring and preserving materials by mounting on cloth, assembling the essential materials for the mounting process, mounting several types of material by this process).

Prints may be ordered from: Audio-Visual Center, Indiana University, Bloomington, Indiana, or Educational Film Library Association, 345 East 46th Street, New York 17, New York.

Dear Member of the NATIONAL ASSOCIATION
OF SECONDARY-SCHOOL PRINCIPALS

Is your name and address correct on our mailing list?

Are you receiving your BULLETIN regularly?

Take a few seconds and check your address on the wrapper in which your BULLETIN was mailed. If it isn't correct, won't you immediately drop us a card giving us your old address as well as your new address?

If you will have a change of address within a month, notify us as soon as you know the new address, so we can make the change without any interruption in service to you. Changes require about a month to process. Likewise, due to new postal regulations, the postoffice informs us neither of its inability to deliver second-class mail matter nor of a change of address.

Quite frequently, members write us that they have not received the last two or three issues of the BULLETIN. The reason—they have changed their address, but did not notify us. We are not mind readers, so we have to depend upon our members to inform us promptly of any change in their address. Then, too, printing has become so costly that we are unable to supply duplicate copies (or back copies) without a charge.

Many members change positions during the summer months. When this is the case, notification sent to us promptly will mean that when we mail the next issue of the BULLETIN, every member will receive his BULLETIN at his proper address.

This is an earnest appeal!

Always send us promptly a notice of your change of address.

We're depending on you!

EDUCATORS FAVOR 6-HOUR SCHOOL DAY—A school day of six hours including lunch and activity periods is favored by a majority of 1,281 superintendents, principals, supervisors, and teachers who replied to a recent questionnaire sent out by a Survey Committee from the North Carolina Division of Superintendents.

Ten questionnaires were sent to each superintendent, one for himself and nine for a sampling from the supervisor, principals, and teachers. Returns from this group showed that in general a five-hour day was recommended for first-grade children. A five and one-half day was favored for second grade pupils and a six-hour day was recommended for third grade and upper elementary grades. For high school the median recommendation was six and the one-half hours, with a large number favoring the six-hour day.—*North Carolina Public School Bulletin.*

FILM ON NURSING—Miss Betty Bowles, pediatric nurse from the Mary Hitchcock Memorial Hospital, Hanover, New Hampshire, saw herself in a new role as leading lady in the new student nurse recruitment film, *When You Choose Nursing.* The film was produced with funds provided by Lederle Laboratories, Division of American Cyanamid Company, and made by Willard Pictures. It portrays the work and play opportunities of four nurses in the fields of pediatrics, teaching, industry, and public health.

Distribution plans for the new student-nurse recruitment film call for showings arranged through the 53 state and regional careers committees. On a local basis these committees will show the film to audiences in high schools, club meetings, and civic organizations as well as over television stations and in local motion picture houses. The 16 mm. film—20 minutes in length—can be purchased for $35 or rented at $4 for three days through the Committee on Careers, National League for Nursing, 2 Park Ave., New York.

DEVICE TO HELP IDENTIFY PROBABLE JUVENILE DELINQUENCY—The KD Proneness Scale and Checklist, new screening devices designed to help identify probable juvenile delinquents before they get in trouble, have been released by the World Book Company. They can be used with pupils in grades 6 to 12. This pre-delinquency scale and checklist were developed by William C. Kvaraceus, Professor of Education, Boston University. Dr. Kvaraceus, author of *Juvenile Deliquency and the School* has been a staff member of the Congressional Committee investigating juvenile deliquency. His deliquency-proneness indicators serve as aids in identifying those boys and girls who are vulnerable, susceptible, or exposed to the development of delinquent patterns of behavior. They also provide clues to the causes of delinquent or predelinquent behavior. Teachers, counselors, social workers, the clergy, and all those concerned with child growth and development will find these aids particularly useful.

Information materials and specimen sets of the Kvaraceus Proneness Scale and Checklist are available to school principals from World Book Company, 313 Park Hill Avenue, Yonkers, New York.

U. S. CIVIL SERVICE POSITIONS AVAILABLE—The U. S. Civil Service Commission announces the availability of positions of teacher in trade shops, vocational agriculture, industrial arts or general shops, related trades, and general education. These positions begin at $3,795 and are located in Federal and correctional institutions in various states throughout the country. Persons interested in complete infomation should write to: Board of U. S. Civil Service Examiners, U. S. Penitentiary, Levenworth, Kansas. Also available are jobs as printer proofreaders at $2.80 per hour. These jobs are in the Government Printing Office, Washington, D. C. For complete information

concerning them write to: Board of U. S. Civil Service Examiners, Government Printing Office, Washington 25, D. C.

FOUR NEW SOCIO-GUIDRAMAS—Six booklets in the Socio-Guidrama Series by Sarah Splaver are available for school use. The Socio-Guidramas are guidance playets—about ten minutes long—presenting real-life problems (personal, social, family, school, career, *etc.*) which confront young people, parents, teachers, counselors, and other educators. Presentations are followed by audience discussion under teachers' or counselors' leadership. High-school and college classes (guidance, orientation, occupations, English, social studies); school assemblies; group guidance; parent meetings; counselor training classes; mixed audiences of young people, parents, teachers, counselors, and social workers will find them useful. These Socio-Guidramas can be used to stimulate wholesome, intelligent discussion under competent leadership; to lead young people, parents, teachers, counselors, and other educators toward a better appreciation and understanding of each others' points of view and each others' motivations; to improve relationship among these young people, parents, and educators; and to aid them in working out their problems in a mutually satisfactory fashion. They are presented by young people acting out of the several roles in the playets. Where facilities for props are limited, the scenes may be explained to the audience of presentation and much may be left to the audience's imagination. The titles are: *After High School—What?* (Shall it be college or father's business?) 4 roles; *Ma and Sue —On a Job Interview* (To go or not to go with daughter on job interview) 5 roles; *High-School Wedding Belle* (Is the high-school senior ready for marriage?) 5 roles; *"A" Is for Brother* (Athletic, non-studious brother *versus* studious, non-athletic brother) 5 roles; *Mike, The Mechanic* (Mother order—" . . . be a professional, not a mechanic.") 4 roles; *Late Date* (Daughter's dating hours disturb father) 5 roles. Each playlet is 12 pages long and sells for 50 cents each. Order sholld be sent to Occu-Press, 489 Fifth Avenue, New York 17, New York.

NEW AMERICAN ART FILM—The International Film Bureau, Inc., 57 East Jackson Blvd., Chicago 4, Illinois, has available a 16mm. print entitled *Uncommon Clay* (18 minutes), a new sculpture film intended for wide distribution to schools and general audiences. The film was produced by Thomas Craven, photographed by Frederick Bornet, and contains a musical score by Michael Hoffman. It is an introduction to the work studios and personality of six American sculptors—Donald De Lue, Wheeler Williams, Paul Manship, Cecil Howard, James Earle Fraser, and Laura Gardin Fraser—many of whose commissioned works are familiar to the public. Prints of *Uncommon Clay* may be purchased from International Film Bureau at $100 per print or rented at $10 per day or $25 per week.

THE DILEMMAS OF FRANCE—France is confronted today with a variety and multitude of dilemmas that breed a continuing atmosphere of crisis—and sometimes even bring France to the brink of crisis. In the March filmstrip issued by the Office of Educational Activities of the *New York Times* the problems of France are examined in terms of the existing situation, the background that spawned the difficulties and the difficulties that lie ahead. This latest in the series of *Filmstrips on Current Affairs* takes up, in 59 frames, the threat to the free world and the United States, so closely bound to France, posed by the way French leadership of western Europe has been jeopardized. It takes up the instability in French government, the shifting political alignments, the economic and social problems, the pressures from the extremes of left and right, the drain of the Indo-China war, the stirrings in the colonial empire, and the relentless memories of wars with Germany.

SUMMER WORKSHOPS
for Junior High-School Administrators

These announcements were obtained from Dr. Harold B. Brooks, Coordinator for the Junior High Schools, and past president of the National Association of Secondary-School Principals:

Los Angeles State College, Los Angeles, California
DATE: July 12-July 30, 1954
DIRECTOR OF WORKSHOP: *Marian Wagstaff*
CENTRAL THEME: "The Unique Problems of the American Junior High School."

* * * * *

University of Oregon, Eugene, Oregon
DATE: July 5-16, 1954
DIRECTOR OF WORKSHOP: *Arthur C. Hearn*
CENTRAL THEME: "An Overview of the Junior High School; Its Philosophy, Functions, Administration, and Evaluation."

It is planned to have a more complete list of junior high-school Summer Workshops and courses for 1955 appear in THE BULLETIN in 1954-55.

The filmstrip is 35mm. and is illustrated with photographs, cartoons, and maps that present the subject in clear, graphic terms. A teacher's discussion manual, with an introduction to the topic and additional data on each frame, accompanies the filmstrip. *The Dilemmas of France* is the sixth in the 1953-54 series of eight New York Times Filmstrips on Current Affairs. The entire series of eight filmstrips is available for $15; individual filmstrips cost $2.50 each. They are available from the Office of Educational Activities, the New York Times, Times Square, New York 36, New York.

SCHOOL CONSTRUCTION—Additional Federal funds totalling $7,800,389 have been reserved by the U. S. Office of Education for school construction projects in "Federally-affected" defense areas. The funds will be used to help 37 local school districts in 14 states provide the necessary classroom accommodations for their increased enrollment because of nearby Federal installations. These additional funds bring to more than 15 million the total amount reserved to date under provisions of P. L. 246, authorized by the 83rd Congress.

PARENTS' MAGAZINE TO AWARD SERVICE BY YOUTH GROUPS—To encourage the worth-while use of leisure time by young people, *Parents' Magazine* has inaugurated the Annual Youth Group Achievement Awards, consisting of a $1,000 savings bond award and 250 honor certificates. The $1,000 savings bond will be awarded annually to the youth group which has rendered the greatest school, community, or other outstanding public service during the year. Two hundred fifty other youth groups which have rendered useful civic service will receive engraved certificates as honor awards, and their names will be placed on *Parents' Magazine's* Honor Roll. The service need not have been confined exclusively to a single year.

Eligible for the awards are all groups in the United States and its possessions and Canada, with a minimum membership of ten. The members may be boys or girls or both, not exceeding high-school age. Nominations may be made by the groups themselves; teachers; principals; civic, school, or church leaders; newspaper editors; parent-teacher associations; and interested individuals. Closing date for nominations for the 1954 awards is November 1, 1954, and instructions regarding their submission are available from *Parents' Magazine*, 52 Vanderbilt Avenue, New York 17, New York.

TWO NEW HIGH-SCHOOL TESTS—Two new high-school tests have been published which should be of significant interest to high-school administrators and teachers, particularly to the teacher of social studies. One of these, *Dimond-Pflieger Problems of Democracy Test,* is an end-of-course test measuring the extent to which pupils have achieved the important objectives of a high-school course in problems of democracy. The test covers knowledge and understanding of government, economics, sociology, and international affairs. Its content is based on analysis of topics contained in 15 widely used high-school textbooks in problems of democracy. The detailed *Manual of Directions* shows that results of the analysis were carefully checked against recent courses of study and professional literature, as well as by a number of editorial readers and specialists in the field. This test will serve a useful purpose in any high-school testing program. Although the norms provided are based on the performance of students at the end of a course in problems of democracy, they are sufficiently representative to serve as a general basis for interpreting scores of any high-school group. This is available at $3.15 net per package of 35. A specimen set will be sent postpaid upon remittance of 35 cents.

The other test, *Watson-Glaser Critical Thinking Appraisal,* is designed to provide problems and situations which require the application of important abilities in critical thinking. It consists of five sub-tests measuring different factors related to the total concept of critical thinking: inference; recognition of assumptions; deduction; interpretation; and evaluation of arguments. This test should have broad use as an evaluation instrument and as a teaching tool to help pupils develop reliable techniques for logical reasoning that will guide them in daily-life situations. A *Manual of Directions* provides a discussion of uses of the test and discusses several specific interpretations of results, depending upon the purpose for which the tests were given. This test is available at $3.70 net for a package of 35. A specimen set will be sent postpaid upon remittance of 35 cents. Send all orders to the World Book Company, Yonkers-on-Hudson, N. Y.

MATERIALS ON THE UN—The American Association for the United Nations, 345 East 46th Street, New York 17, New York, has considerable material available for classroom use. Among these materials are the following:

Background Paper on Korea. (1 page.) Single copy free, $3 per 100.
UN Charter and Statue of International Court of Justice. 10c. 64 pp. (3⅜" x 4⅞".)
Questions and Answers about the UN. (6 pp.) Single copy free.
What's in It for US. (8 pp.) Single copy free. $2.25 per 100.
Let's Have the Truth about the UN, a Series of Discussions Guides and Facts Sheets. 25c per set.
Guide to Teaching. (32 pp.) 10c.
Teachers' Kit. 25c. Miscellaneous materials.
How To Organize Model UN Meetings. (9 pp.) 10c. Mimeo.
Girl Scout Packet. 20c. Miscellaneous materials.
Declaration of Human Rights (official text) 5c. 30" x 40" wall posters.
Poster—Flags of All Member Nations of the UN in Color. 15c. 14" x 18" flags in color.

YOUNGSTERS LIKE GADGET SCIENCE BUT PASS UP TECHNICAL CAREERS IN SCHOOL—The gadget science of atomic ray guns, space ships, and hot rods has top priority in the minds of most youngsters, but results of a recent survey indicate that an increasing number of pupils are passing up school science programs because they think the classes are dull and unrealistic. Some 425 science teachers were polled by the Future Scientists of America Foundation of the National Science Teachers Association (NSTA) to determine why a growing number of high-school pupils are turning their backs on those paths which lead to careers in science and engineering. NSTA is a department of the National Education Association. Those participating in the survey are employed in schools having a total enrollment of 326,000 students. Their schools are located in 42 states.

Teachers have several ideas for relieving the manpower shortage in engineering and science, according to the survey. The majority of instructors surveyed believe the average pupils will develop an interest in science if they know its importance in modern technology and the opportunities available in technical careers.

"Gaps and needs" in science programs brought out by the survey indicate that pupil interest can be sparked by: more information about science activities, scholarships; more firsthand contact with scientists, engineers and actual working conditions in laboratories and industry; and better equipped laboratories. Other reasons for the lack of interest on the part of pupils brought out by the survey include: student preference for easier courses which won't lower their grade average; lack of com-

munication between high school and college about science programs; little emphasis on science experience by teachers while pupils are in grade school.

Science teachers recognize their responsibility in these problems and are willing to co-operate with industrial and scientific groups to make their school science classes practical, according to the survey. They emphasize that teachers must first improve their own enthusiasm and training if they expect to give students a genuine picture of science. "It is a real problem to keep the high-school science equipment and activities geared to the scientific events that youth read about in the daily papers. Many aspects of the scientific and engineering enterprise cannot be brought realistically into the classrooms," the survey points out. "The dynamic nature of the scientific and engineering fields tends to make obsolete or inadequate science textbooks, laboratory equipment, laboratory exercises, and the instructor's storehouse of information." The survey points out that teachers need opportunities for summer jobs in engineering and scientific industries; workshops and institutes which will bring them up to date on what is happening in science; and additional college and university work which is taught with the high-school science teachers' problems in mind.

A FOLK ART MUSEUM—A Folk Art Museum, to be known as the Abby Aldrich Rockefeller Museum, will be built in Colonial Williamsburg by John D. Rockefeller, Jr. The new museum, to be erected near the Williamsburg Inn, will house the collection of nineteenth century American folk art presented to Williamsburg by Mrs. Rockefeller and will commemorate her pioneer interest in the preservation of the homespun arts of America, a field in which she was one of the early collectors. The distinguished collection comprises over 400 paintings, sculptures, and exemples of miscellaneous domestic crafts such as needlework, ceramics, and metalwork.

The new museum will be located outside of the restored area of Williamsburg and will have no connection with eighteenth century exhibitions there. It will be administered, however, by Colonial Williamsburg with special funds given to that organization by John D. Rockefeller, Jr., for this purpose. The museum is planned as a series of rooms suggestive of domestic interiors similar to the surroundings in which the objects were orginally to be found. Emphasis will be given to regional aspects of folk art, which will be reflected in the decoration and architecture of the various rooms. Architectural plans as well as preparation of the exhibit are in progress. The museum opening to the public is expected in late 1955.

VISUAL AIDS SERIES OF CHARTS FOR CLASS IN SEWING—The Advance Pattern Company has developed a large chart (17" x 21") entitled *Basic Sewing Step-by-Step*. This is a completely new visual aid developed by the Advance Pattern Company under the supervision of Mrs. Edna Bryte Bishop, Educational Director. It is designed to help the teacher create greater interest and enthusiasm among her beginning pupils. Presented in chart form, with a sturdy easel back, this aid can be mounted on a desk or a table for easiest use. The construction details can be easily demonstrated to the entire classroom at once, and the chart is so organized that each page (24 in number) can be covered in a single class period. For purposes of continuity and best to emphasize basic sewing techniques, a simple one-piece dress (Advance Teen #6528 and Advance Junior #6535) has been used to explain each step of the construction from pattern to finished garment. A similar style is available in girls' and misses' sizes (Advance Girls #6516 and Misses #6120). This style is easy to make and can be attractively accessorized to individual taste. For complete information concerning the availability of this visual aids series of charts, write to Advance Pattern Co., Educational Division, 1407 Broadway, New York 18, N. Y. An *Instructors' Manual*

(8 pages) supplements the material in the chart and provides the teacher with more detailed information on figure types and sizing, pattern alteration, and general data on the unit of method of construction.

TEACHERS WILL STUDY HISTORY AND EDUCATION—A workshop in *Early American Life and Culture* will be given in restored Williamsburg, Virginia, during the summer session of the College of William and Mary. For the third successive summer, experts from Colonial Williamsburg, Inc., and from the College will co-operate to give three- and six-week sessions which will carry academic credit. The workshop program offers students the rich resources of the restored colonial capital of Virginia. Activities include tours of the extensive area and of surrounding Jamestown and Yorktown. There are tours to archeological sites, special exihibits, and behind-the-scene views of the art of reconstruction in progress. Beginning June 15, the three-week workshop lasts until July 2, the six-week session until July 23. Tuition is $10.50 for three weeks, $21.00 for six weeks.

Many teachers and others come to Williamsburg especially for the workshop course. Some combine the workshop with other summer session classes offered at the College of William and Mary. Of especial interest to teachers during past summers have been elementary- and secondary-school workshops which fit into time offered by the colonial workshop. Subject matter of the workshop includes colonial garden designs, furnishings, art, music, crafts and shops, plantation life, and politics. Emphasis is placed upon interpretation of everyday life, making a living in colonial times, and culture of 18th century America. Further information may be obtained from Dr. Kenneth Cleeton, Director of Summer Sessions, College of William and Mary, Williamsburg, Virginia.

FEDERAL AID TO SCHOOL DISTRICTS—Additional Federal funds totalling $11,545,924 have been reserved by the Office of Education, U. S. Department of Health, Education, and Welfare, for school construction projects in Federally affected defense areas, S. M. Brownell, Commissioner, has announced. The funds will be used to help 39 local school districts in 20 states provide the neceessary classroom accommodations for their increased enrollment because of nearby Federal installations. The states scheduled to receive the funds are: California, Colorado, Georgia, Illinois, Indiana, Kansas, Louisiana, Maryland, Michigan, Montana, New Jersey, New Mexico, New York, Nevada, Ohio, South Dakota Tennessee, Texas, Virginia, and Washington. These additional funds bring to more than 26 million the total amount reserved to date under provisions of Title III of P. L. 246, authorized by the 83rd Congress.

SECONDARY SCHOOLS STUDIED FOR CHARACTERISTICS RELATED TO STUDENTS' PERFORMANCE—What characteristics of secondary schools are most closely related to the performance of their pupils on academic aptitude and achievement tests? Size of school? Teacher salary? Teacher training? Availability of facilities such as library, science laboratory, sound film projector? An adequate answer to this entire question would make possible the more meaningful interpretation of students' performance on standardized tests. At the moment, little of the needed information is available. For example, we do not know whether or to what extent the test performance of pupils in schools with certain kinds of resources may be expected to differ, on the whole, from that of students in schools which lack these resources. This in turn makes it difficult to take account of "opportunity" factors in evaluating the performance of a particular pupil, or even to decide what factors should be taken into account. To secure appropriate data, a nationwide study of secondary-school characteristics was undertaken a few months ago at the Educational Testing Service, 120 Nassau Street,

Princeton, New Jersey, under the direction of William G. Mollenkopf and S. Donald Melville. A 25-item questionnaire was developed and pretested, and the final form of the questionnaire was mailed late in December to over 1,800 principals of public secondary schools. Independent and parochial schools will be added later. In sampling, both school size and location have been taken into account, as well as type of institution. Since the interrelations among the questionnaire items may be different for large and for small schools, analyses of intercorrelations may be carried out for schools grouped according to size. Examination of patterns of interrelations is expected to reveal the manner in which various school characteristics tend to group themselves. Schools having particular combinations of characteristics will be asked to co-operate further by administering selected tests to their pupils. About 100 schools will be asked to test all their 9th-grade pupils; another 100 schools, to test all their 12th-grade pupils. Finally, the test results will be correlated with the various characteristics to determine which school characteristics are most closely related to pupils' test performance. The results of this study should be of considerable value in future educational planning.

STANDING-ROOM-ONLY GROWS WORSE IN NATION'S SCHOOLS—The standing-room-only situation, which began plaguing the nation's schools in 1947, will become worse with the new year. Public school enrollments are 1,197,000 over last year. The increase has come largely from young pupils who are entering already crowded classrooms for the first time. So says the National Education Association in its annual look-ahead estimate of school enrollments and teacher supply for the school year 1953-54. Although the increased enrollment was expected, the NEA research division's survey reveals that public education's 7-year-old headache of adequately housing and instructing almost 29 million pupils will not be cured in 1954.

Shortages of teachers are developing this year, according to the NEA, in rural areas and at the secondary-school level. Forty-five states reported a shortage of rural elementary-school teachers. A shortage of secondary-school teachers in such fields as industrials arts, vocational education, music, and physical education was reported in 36 states. The NEA places the "real" demand for new teachers in 1953-54 at 150,000. This number would replace the 75,000 who leave the profession annually because of illness, death, retirement, or other employment. If administrators could employ another 75,000, according to the research division, they could not only reduce swollen classes to more suitable and efficient size, but could also replace many inadequately trained emergency teachers with fully prepared instructors.

In the overcrowded classroom, comments NEA, it is impossible for the teacher to give every pupil individual attention. It cites a previous research division survey that, in 526 urban communities, one third of the pupils were crowded into classes of 35 or more. If classes in these urban places alone were to be limited to 30 pupils, these school systems would need 12,380 additional classrooms and teachers.

The housing of school children, a long-time, ever-present problem of elementary schools, now has secondary schools feeling the pinch in 41 states, according to the survey. An estimated 5 billion dollars is needed for new buildings to house the 1953-54 enrollment in public schools—but even that figure would not account for repair and placement of old buildings nor provide for future needs.

In a look at current teachers' salaries, the research division notes that the estimated average salary for instructional staff in public schools (classroom teachers, principals, and supervisors) has risen to $3,725, and adds that this amount will buy only as many groceries, pay as much rent, and provide as much clothing as $1,934 did in 1935-39. One in seven public school teachers, according to the survey, is

earning less than $2,500 this year; one in six is making as much as $4,500. Furthermore, the trend toward increasing the teacher's annual average salary is moving at snail-pace rate compared with the increase in other occupations. In 1939, the average wage-earner in this country made 11 per cent less than the average teacher. In 1952, the average wage-earner and the average teacher earned about the same, the report notes. Current trends do not show the special gains necessary to overcome the shortage of qualified teachers because of the competitive higher salaries in other occupations.

PHI DELTA KAPPA'S NEW HEADQUARTERS—Phi Delta Kappa, professional fraternity for men in education with 60,000 members enrolled, has chosen Bloomington, Indiana, as the site of its permanent international headquarters. Final selection, by the fraternity's board of directors meeting in Atlantic City in mid-February, followed a six-month intensive survey and consideration of 20 towns and cities in six midwestern states. A functional-type office building, planned around a careful analysis of headquarters operations, will be erected on purchased land adjacent to the campus of Indiana University. Completion is scheduled for early 1955. Heretofore the fraternity has occupied rented space in Homewood, Illinois, a Chicago suburb, for the past 16 years, and in Chicago for 10 years previously. Phi Delta Kappa has 81 chapters in leading universities and colleges and 62 alumni chapters in other education centers. These chapters carry on vigorous professional programs with particular emphasis on research, service, and leadership in the promotion of free public education. The founding and expansion of the fraternity closely parallels the growth of the science of education. The 50th anniversary of Phi Delta Kappa will be observed at Bloomington, Indiana, on January 1, 1956, with Alpha Chapter, Indiana University, as host. It is expected that the new building will be dedicated as part of the anniversary service.

PROGRAM MATERIAL FOR HIGH SCHOOLS—The National Child Labor Committee, 419 Fourth Avenue, New York 16, N. Y., has considerable material that is of interest to high-school youth. This material is available as recordings and as pamphlets. Included are such recordings as: *A Decision for Tommy* (78 or 33⅓ r.p.m.), a 30-minute recording concerning the experiences of a seventeen-year-old drop-out who eventually decides he needs a high-school diploma, and *Is High School Worth While?* (78 or 33⅓ r.p.m.), a frank and spontaneous discussion of high-school seniors and recent graduates. The former recording is available at $6 a set for 78 r.p.m. and $4 a set for 33⅓ r.p.m. The latter recording is available at no cost except for postage for the return of the recording. Pamphlets that are available are as follows: *Just a Minute* (24 pages, 10c); *Why Stay in School?* (48 pages, 40c); *Let's Talk About Tomorrow* (16 pages, 10c); *Early School Leavers* (96 pages, $1.25); *Work Experience in Secondary Education* (96 pages, $1); *Special Services for the Drop-Out* (reprint of speech, free). Orders for this material should be placed with the National Child Labor Committee at the above address.

HIGH-SCHOOL FILMS ON BANKING—The American Bankers Association has recently provided five 16mm. sound films in black and white that are exceptionally helpful in presenting the subject of banking to high-school pupils. Each film is approximately eleven minutes in length. These films are available only through direct purchase by local banks who in turn lend or donate the films to schools. Any school that is interested in securing one or more of these films should contact one of the banks serving its community. The five prints are as follows: *Pay to the Order of—* (film on checks); *How Banks Serve* (film on basic services); *Money Talks!* (film on

savings and thrift); *A Future To Bank On* (film on banking as a career); and *Using Bank Credit* (film on bank credit).

RETAILING AS AN OCCUPATION—Retailing is attracting an "ever larger number of better students," Dean Charles M. Edwards, Jr., of New York University's School of Retailing told a gathering of high-school seniors recently. Speaking at the first annual Careers in Retailing Conference for high-school students at NYU, Dean Edwards observed that there has been a keener understanding among students of the advantages that retailing affords to those who choose it as a career field. "Opportunities in the field are numerous," he declared. "Retailing today embraces nearly 1,800,000 stores throughout the nation, and new ones are being added every day. It engages nearly 8,000,000 people, or one out of every eight gainfully employed Americans. The people who choose retailing as a career will find that it offers varied opportunities, with many types of stores and many types of positions from which to choose. In retailing there is a place for every talent, whether it be for the accountant, writer, artists, engineer, lawyer, or buyer. For the young person, the opportunities in retailing are especially rewarding. The field offers high pay and rapid promotions. In addition, it has a high proportion of executive positions, with approximately one of every nine employees holding jobs of executive rank.

FILMSTRIP DIRECTORY—A comprehensive list of filmstrips on all subjects is included in the completely revised third edition of the *Filmstrip Guide*. It replaces all preceding volumes and supplements. ($5 bound volume; $5 supplement service for 3½ years; $8.50 special combination offer for both parts of the service, ordered and billed at one time). For each of the 5,882 filmstrips (35mm.) listed, the *Guide* reports: date of release, whether sound or silent, color, grade level, key to source of purchases, price if not free, and whether a study aid accompanies. A directory of main sources is at the end. Moreover, in line with its past policy, the *Guide* begins with the year 1947, in order not to overlap the material in *Filmstrips* by Vera M. Falconer (1948). Part I is an alphabetic and subject index of all the filmstrips by individual title, series title, subject. Part II classifies the strips by subject matter according to the Dewey Decimal System and includes descriptive data plus order numbers for Library of Congress catalog cards. Complete information can be secured by addressing the publisher: H. W. Wilson Co., 950-972 University Avenue, New York 52, N. Y.

INFORMATION FOR VISITORS—A faculty committee of the Solomon Juneau High School of Milwaukee, Wisconsin, Elias N. Lane, Principal, has prepared an 8-page booklet of information about the high school. Parts included in the booklet are: A Welcome, We Believe, We Aim, Our Multiple-Period Classes, Our History, Our Teacher-Training Program, Our Honor Study Halls, Our Guidance Program, Some Statistics, Our Activity and Service Program, And So, and a list of the names of the teachers on the faculty committee. The book was mimeographed by secretarial service students, and the cover by a silk-screen press was produced by the art students of the school.

THE BOY BEHIND THE PINS—This is a report on pinsetters in bowling alleys. A limited number of free copies of this bulletin are available from the Bureau of Labor Standards so long as the supply lasts. Send requests to William L. Connolly, Director, Bureau of Labor Standards, U. S. Department of Labor, Washington 25, D. C. Sales copies are also available in quantity from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 25 cents each. Send order and

remittance for sales copies directly to the Government Printing Office. This is a report that should be read by all persons who live in towns where bowling alleys are provided as a commercial enterprise.

NEW POWER FROM THE ATOM—The world has a new source of power—atomic energy. On the horizons of nuclear science lie many peaceful uses of atomic energy in industry, agriculture, and medicine. But mankind is also confronted by the possibility of an atomic war, one in which nuclear weapons might be used to destroy our civilization. The April filmstrip issued by the Office of Educational Activities of the *New York Times* examines the steps leading up to our knowledge of atomic energy and how atomic science is being used for peace and national defense today.

This latest in the series of *Filmstrips on Current Affairs* takes up, in 57 frames, our use of atomic energy in developing new crops and treating diseases, and how some day atomic power may turn the wheels of industry. It examines the development of powerful new atomic weapons and what they mean to us in terms of the tense world situation. It outlines the theoretical composition of the atom, explaining how atoms give off energy. It summarizes past and present attempts of the international control of atomic energy. The filmstrip is 35mm. and is illustrated with photographs, cartoons, maps, and diagrams that present the subject in clear graphic terms. A teachers' discussion manual, with an introduction to the topic and additional data on each frame, accompanies the filmstrips. "New Power from the Atom" is the seventh of the 1953-54 series of eight New York Times Filmstrips on Current Affairs. The entire series of eight filmstrips is available for $15; individual filmstrips cost $2.50 each. They are available from the Office of Educational Activities, the New York Times, Times Square, New York 36, New York.

CHEMICAL PROGRESS WEEK—The important role of the chemical industry in American life will be brought home to thousands of Americans in their own communities by members of the Manufacturing Chemists' Association during the first annual Chemical Progress Week, May 17-22. Many companies have done an excellent job in telling the story of the chemical industry on an individual basis. Now for the first time the industry will band together to explain, all at the same time, the contributions to the American people that are resulting from the progress of the chemical industry in terms of individual welfare.

On the basis that the best people to tell Americans about the chemical industry are their neighbors who work in it, most of the Chemical Progress Week programs will be carried out in the communities of the nearly 5,000 plants across the nation of MCA member companies. Where two or more plants exist in a community, plant managements will be asked to form community committees. Representatives of many of the member companies have volunteered for special assignments for the industry observance, and the work will be co-ordinated by the MCA Public Relations Department at 1625 Eye St., N. W., Washington, D. C.

U. S. OFFICE OF EDUCATION SURVEY—The School Facilities Survey reveals a current need for public elementary- and secondary-school facilities equivalent to a single-story structure 50 feet wide extending from the Statue of Liberty to the Golden Gate Bridge . . . The nation's school districts need $10.6 billion for new school construction. Of this sum, the states and local governments can provide $5.9 billion. The deficit of $4.7 billion can only be provided by the Federal government, according to Federal officials . . . School building experts consider 27 per cent of the nation's elementary and secondary schools satisfactory, 40 per cent fair, and 33 per cent unsatisfactory . . . Nearly 90 per cent of America's elementary schools do not have

kindergartens . . . More than half of America's secondary schools do not have art rooms . . . School systems in the United States need a total of $120,000,000 immediately to buy new buses for transporting school children . . . In 1952, some 700,000 school children attended classes in rented quarters or in structures not suited for school use.

SCHOOL AND COLLEGE PROGRAM FOR TEACHERS—The first session of the School and College Program for Teachers convened at the University of Chicago during the summer of 1953. The program was concerned primarily with problems of articulation between high school and college. It was conducted by means of demonstration sections of high-school students in biological sciences, English, humanities (literature, art, music), physical sciences, mathematics, social sciences (including history), and by means of seminar discussions, laboratories, and occasional lectures. One third of the participants were selected from the faculties of junior colleges and colleges, two thirds from the faculties of high schools. For a participant, a typical day consisted of one hour during which he observed his "demonstration section," which was taught by a member of the university faculty, and in which the students were high-school juniors and seniors from Chicago public schools. The demonstration class was followed by two hours of discussion with the instructor and fellow participants —criticism of the class, planning for future classes, preparation of examination, and selection and preparation of materials. On three afternoons each week, lectures or discussions of interest either to the entire group or to various re-combinations within it were scheduled. No participant attended demonstration classes in more than one subject.

Jointly sponsored by the University of Chicago and the Chicago public school system, the program was supported by a grant from the Fund for the Advancement of Education. With the same sponsorship and support, the second session of the School and College Program for Teachers will convene at the University of Chicago from June 28 to July 30, 1954. Sections will be provided in all subjects represented in 1953 and in foreign languages. Scholarships will be granted in the amount of full tuition ($120). Graduate credit in Education is available for those who wish to apply for it. Since the capacity of the program is limited, principals, superintendents, and deans are invited to nominate from their staffs teachers who in their opinion will be able to adapt to the circumstances of their own schools and colleges procedures and materials which they find interesting, and to describe them effectively to their colleagues. In awarding scholarships special preference will be given to groups of teachers representing the various fields of study within a single institution or in neighboring institutions. Several such teams took part in the program in 1953. University housing, library, and recreational facilities are available to all participants. Inquiries should be sent to Harold B. Dunkel, University of Chicago, Chicago 37, Illinois.

HISTORY OF THE HART CHARTS ON THE COMPARISON OF ENCYCLOPEDIAS AND DICTIONARIES—Mr. Hart states that ten years of experience selling encyclopedias taught him that some reference books are very good—some very bad, but that generally the buyer has no means of knowing which is bad, or which is not suited to his particular needs. Sometimes advertising and sales talks in the book business are notoriously false. Any book can be made to seem good by a smooth salesman.

Beginning in 1929, Mr. Hart has compiled 51 editions of the *Comparison of Encyclopedias* and 12 editions of the *Comparison of Dictionaries*. Their sole purpose is to assist book buyers in making wise choices. The approach has not been cynical,

as in some consumer services; but the basic assumption is that the best encyclopedias are 100 per cent and that most publishers try to serve the public well. Mr. Hart has interviewed 15,000 school principals, 200 college presidents, 300 librarians; and the editors and the publishers of *all the* encyclopedias and dictionaries; and he has corresponded with thousands of reference book users.

The above-named two charts which he publishes are not mere personal opinions, but represent the consensus among users, as conscientiously as is in his power. Most of the figures are his own personal count; though sometimes he uses publishers' figures. He has been open to honest suggestions. He has been threatened with lawsuits by five or six publishers, without penalty—because he spoke only the truth. Persons considering the purchasing of dictionaries or encyclopedias should first study his charts. They are available for 25 cents each from the following address: Laurance Hart, 14 West Walnut St., Metuchen, New Jersey.

TEACHER SUPPLY AND DEMAND—The March, 1954, issue of *The Journal of Teacher Education* is devoted to teacher education. Topics discussed include: Teacher Supply and Demand; Follow-Up Study of Recent College Graduates Who Were Prepared for Teaching; School-Age Population Projected to 1965, Grade-by-Grade; Making State and Local School-Population Projections; Educational Implications of Population Change; Selective Admission to Teacher Education; and The Teacher's Personality. Copies of this issue may be purchased for $1 each. This journal is published four times during the year and is available on an annual subscription basis of $4. Place all orders with *The Journal of Teacher Education*, 1201 16th St., N. W., Washington 6, D. C.

HIGH SCHOOL GRADUATION REQUIREMENTS—The Research Department of the Cincinnati public schools recently sent questionnaires to school systems in all cities in the United States of 100,000 population or more. Sixty-nine responses were received from the 106 school systems. The report made from the sixty-nine responses was concerned with (1) the type of basic unit used in these schools, (2) the unit requirements for graduation, (3) the time required to earn a basic unit, (4) required grouped sequences or majors and minors.

The basic unit used by all systems replying was the Carnegie unit, or some multiple thereof. Most school systems required four basic units for each school year—16, if pattern was 9-12; 12, if pattern was 10-12. Most systems requiring more than sixteen basic units for high-school graduation gave basic unit credit for health and physical education.

The average number of weeks per year required to earn one basic unit was thirty-seven. The average number of class periods per week required to earn one basic unit was five. The average number of minutes per day required to earn one basic unit was fifty-one.

Two thirds of the systems indicated that grouped sequences of units in certain subject matter fields were required. In those systems requiring grouped sequences, three units usually constituted a major and two units constituted a minor. Two majors and two minors usually were required.

Almost all school systems required at least three years of English. Most systems required one to two years of American History and other social studies, one year of mathematics, one year of science, health and physical education from one to four years.—*Superintendent's Newsletter,* Phoenix Union High School and Phoenix College, Phoenix, Arizona. March, 1954.

DID YOU KNOW THAT—During the past school year in the United States there were: 10 residential schools for the deaf reported as having an accredited junior high school; 2 day schools for the deaf reported as having an accredited junior high school; 3 private and denominational schools for the deaf reported as having an accredited junior high school; 10 residential schools for the deaf reported as having an accredited senior high school; 2 private and denominational schools for the deaf reported as having an accredited senior high school. Persons interested in education programs for deaf children will find this information and other pertinent data in the January issue of the American Annals of the Deaf available from Gallaudet College, Washington 2, D. C., at $2; yearly subscription, five numbers, $4. The magazine is the official organ of the Conference of Executives of American Schools for the Deaf and Convention of American Instructors of the Deaf.

PRACTICAL ARTS PROGRAM—Most of the March, 1954, issue of the *California Journal of Secondary Education* is devoted to a symposium on changing concepts in the practical arts. Articles appearing in this symposium are entitled "Changing Conceptions in the Practical Arts—An Overview," "The Practical Arts—Past, Present, and Future," "Ventura: A Living Example of the New Practical Arts Teacher and His Program," "Teaching the 3 R's in the Industrial Arts Program," "Both . . . And . . . ," "Technical Institute Curriculums: Changing Conceptions in the Junior College," and "No-Man's Land in the Practical Arts." Copies of this publication may be obtained at 50c each, however, a subscription to the magazine which is published monthly, eight times during the school year, October to May, may be obtained for $3 per year. The April issue of the *California Journal* contains a symposium on recruitment in high school for the teaching profession.

A CORE PROGRAM—The winter issue (February, 1954) of *The Bulletin of Education* of the University of Kansas contains an 8-page article entitled "Meeting the Needs of Youth Through a Core Program" by Karl D. Edwards, Professor in the School of Education at the University. In this article he outlines various steps that may be taken in the development of the core approach. Those interested in curriculum proceedings will find his article enlightening.

This is the *last* of THE BULLETIN for
the present school year.

The next issue will be the October, 1954, issue.

A pleasant summer to you.

Membership Secretaries of State High-School Principals Organizations

AFFILIATED WITH THE NATIONAL ASSOCIATION OF SECONDARY-SCHOOL PRINCIPALS

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Tennessee Association of Secondary-School Principals—*Howard G. Kirksey*, Professor of Education, Middle Tennessee State College, Murfreesboro, Tennessee.

Texas Association of Secondary-School Principals—*W. I. Stevenson*, Principal, Milby Senior High School, Houston, Texas.

Utah Secondary-School Principals Association—*Wilburn N. Ball*, Director of Secondary Education, 223 State Capitol, Salt Lake City, Utah.

Vermont Headmasters Association—*Joseph A. Wiggin*, 92 State Street, Montpelier, Vermont.

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West Virginia Association of Secondary-School Principals (*White*)—*Fred S. Coffindaffer*, State Dept. of Education, Room 125, Capitol Bldg., Charleston, West Virginia.

West Virginia High-School Principals Conference (*Colored*)—*Lawrence V. Jordan*, Principal, State College High School, Institute, West Virginia.

Wisconsin Association of Secondary-School Principals—*Harold L. Paukert*, Supervising Principal, Kohler Public Schools, Kohler, Wisconsin.

Wyoming Association of Secondary-School Principals—*Loyd D. Crane*, Principal, Cheyenne Senior High School, 3619 Carey Avenue, Cheyenne, Wyoming.

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